

For TRS-80® Color Computer & TDP-100™ Users

**PREMIERE
ISSUE**

Color Computer

MAGAZINE

March 1983

\$2.95

William Barden, Jr.
from *Color Computer Graphics*

Jake Commander's
Wonderful World of Color

Dennis Kitsz
on Custom Color Applications

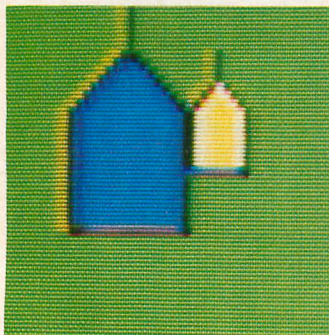
- A Graphic Trip Through the Spiral Galaxy
- Tick Talk Teaches Kids to Tell Time
- Easy to Use DBM in Basic
- Field of Honor, a Chivalrous Battle for the Hand of a Maiden
- How to Hook into Bulletin Boards
- Plus Word Processing Guide, Reviews, and lots more . . .



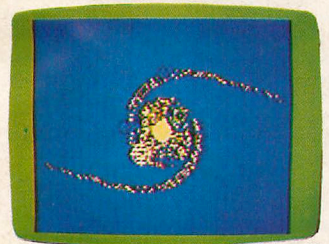
Cover by William A. Giese

THE Color Computer... MAGAZINE

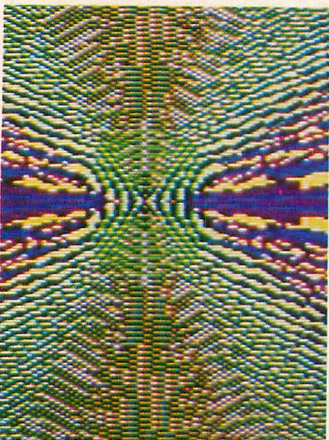
FEATURES



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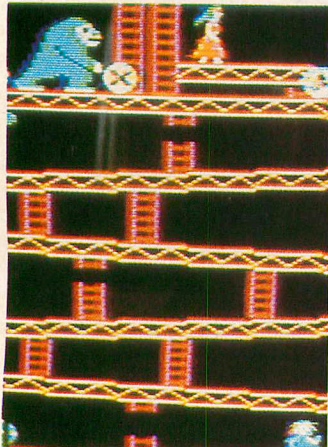


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pg. 60

pg. 32



9/Congratulations, You Own an Incredible Machine!

(General)

by Jake Commander

Being taken on a tour of your Color Computer by Jake Commander is like traveling the Mississippi with Mark Twain.

14/Hello World! by Bob Rosen

(Communications)

The right software package, a modem, a telephone, and this article will turn your computer into a communication center.

16/Stash a Directory by Douglas L. Swank

(Utility)

One short utility to hide an extra disk directory and another to find it if the original ever bombs out.

20/Chapter 7 by William Barden Jr.

(Graphics)

This excerpt from Bill's book, *Color Computer Graphics*, examines the DRAW command.

24/Field of Honor by Scott L. Norman

(Game)

Your squire readies your mount as your opponents line up to battle you for the hand of one of the king's daughters.

28/Your Basic DBM by Paul Detwiler

(Home Management)

Managing your records is simple and quick with this very basic file manager.

32/Spiral Galaxy by Lynn Davis

(Graphics)

Create a galaxy using polar graphing techniques. Watch stars explode, and the birth of the universe.

40/Custom Color by Dennis Kitsz

(Hardware)

Upgrade your computer from 4K to 16K, and 16K to 32K. Also install the circuitry to connect to a color monitor.

48/Tick Talk by Richard Ramella

(Education)

Using a standard clock face and some good old fashioned advice, teach your children how to get home in time for dinner.

DEPARTMENTS

2/PEEK (03,83)

Your guide to the issue.

52/REVIEWS\$

Color Computer word processors compared. (A few late entries coming next month). Also: Donkey King, Nanos System Reference Cards, RS232 Expansion Cable, TDP System 100, Star Trench Warfare, and others.

64/END OF FILE

Closing Comments.

64/FOR...NEXT (04,83)

A look at next month's excitement.

Cover

The Color Computer Magazine makes its debut by William A. Giese.

THE COLOR COMPUTER MAGAZINE is published monthly by New England Publications Inc., Highland Mill, Camden, ME 04843. James S. Povec—President, Michael Perlis—Executive Vice President, H. John Delile—Treasurer

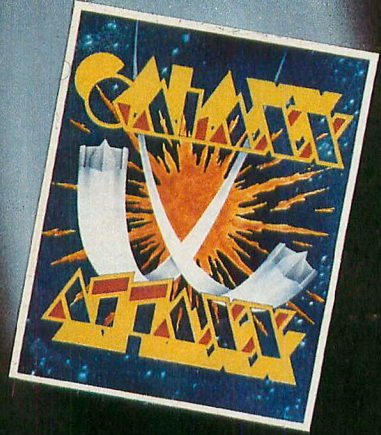
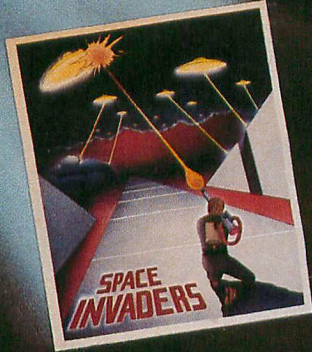
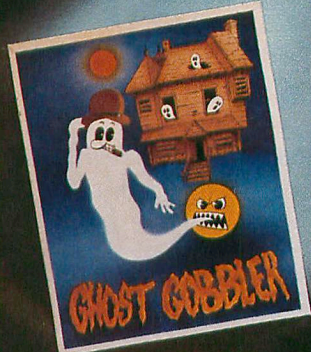
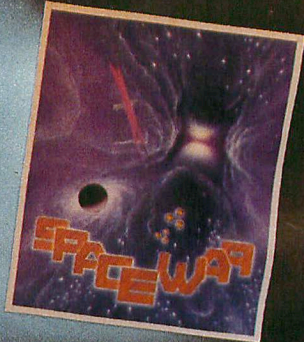
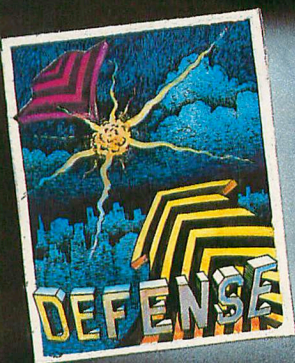
Subscriptions are \$24 for twelve issues. User Group subscription rates available. Outside U.S.A. add \$10 for extra postage.

POSTMASTER: Please send changes of address to The Color Computer Magazine, P.O. Box 468, Hasbrouck Heights, NJ 07604. Application for mailing at second class rates pending at Camden, Maine, and additional mailing offices.

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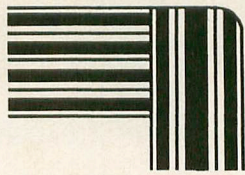
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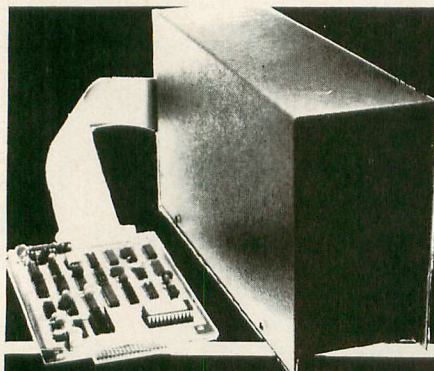


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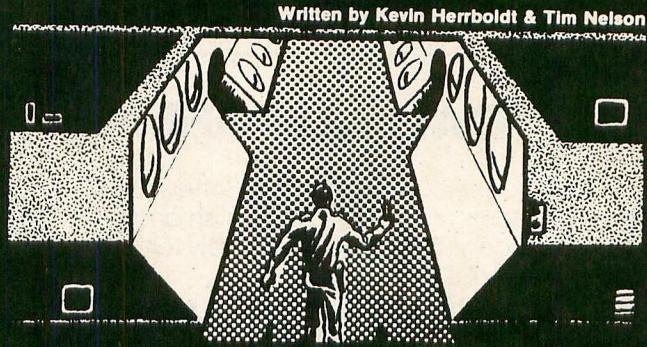
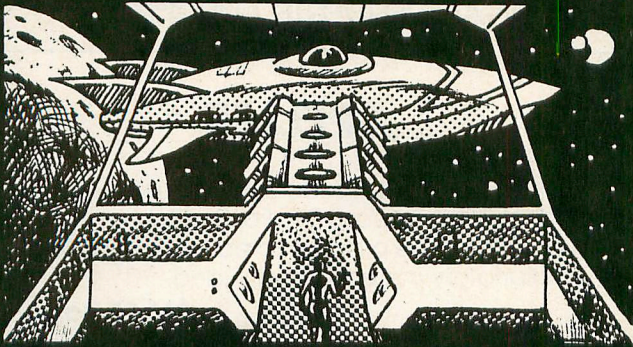
The Publisher assumes no responsibility for the return of unsolicited manuscripts, queries or artwork. Materials submitted to The Color Computer Magazine should be accompanied by a stamped, self-addressed envelope. Editorial offices located at Highland Mill, Camden, ME 04843.

U.S.A. Newsstand distribution by Curtis Circulation Company.

Phototypography by Camden Type 'n Graphics — Camden, Maine; Lithography by Camden Printing — Camden, Maine; Printing by The Lane Press — Burlington, Vermont.

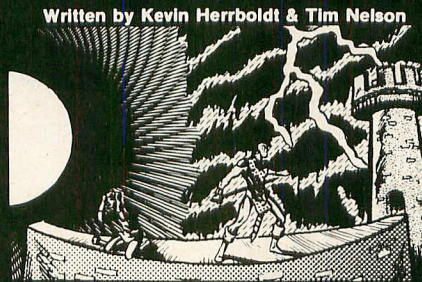
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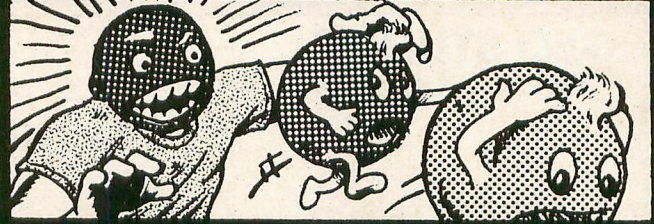
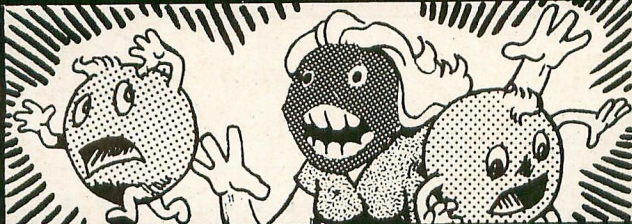
Written by Kevin Herrboldt & Tim Nelson

BEYOND THE CIMEEON MOON A real-time science fiction adventure game of mind-blowing magnitude — staged in deep space on a malign, sentient spacecraft. *Written in fast machine code with 3-dimensional high-res graphics and sound.* Choose from a myriad of fates. Survive the laser barrage set up by a quartet of robots bent towards your destruction.

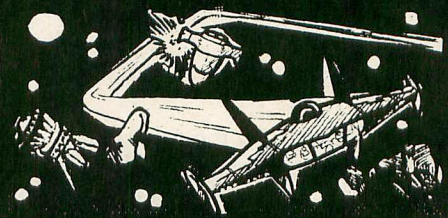
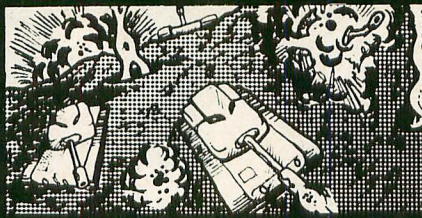
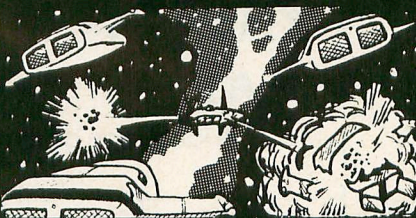


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THE NIBBLER & MS. NIBBLER A fast maze chase game featuring the nibbler man and three bumbling predators. *Written in machine code and joystick compatible*, this fun packed game is enjoyed by all. **MS. NIBBLER** is similar to **THE NIBBLER** described above but features a different maze and **MS. NIBBLER** for the ladies.



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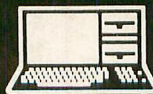


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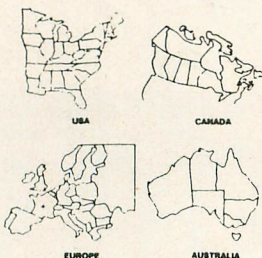
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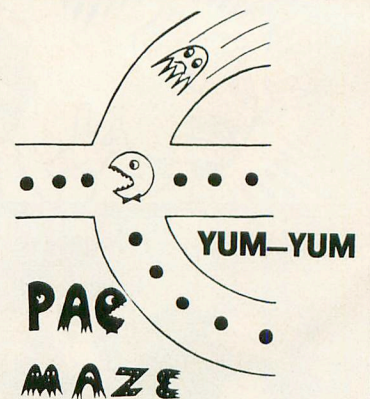
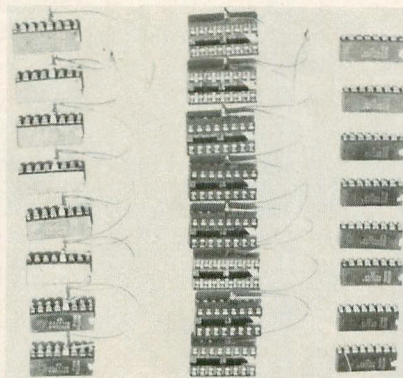
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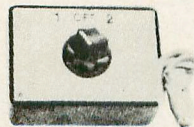


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Congratulations... You Own an Incredible Machine!

by Jake Commander

GIVE YOURSELF A pat on the back. You did good; you bought yourself a TRS-80 Color Computer. What? You mean some of you don't have one yet? Don't you feel awful? How can you walk in public knowing what you're missing, knowing that shivering in the corner of some Radio Shack store a certain Color Computer is waiting to be given a warm home — YOUR warm home. Feeling guilty? Well, to assuage your guilt and (maybe more importantly) to flatter the egos of all of us confidently smiling owners, here's why I think our grins appear so smug.

Take a look at your Color Computer. If you just got one back from the store this very day, unpack it, lay it on the table and stand back and admire the machine. Self-indulgent? Yes — great isn't it! Hey wipe that speck of dust off and savor the gleam. Under the hood of that cute little compact lies the most powerful eight-bit microprocessor (MPU) on this planet — the 6809. To be more precise, it's a 6809E; the E means it's driven from an external source of clock pulses (the heartbeat of the computer). If you have the urge to learn machine code programming, don't hesitate — rush right in. If you learn assembly language techniques on this chip, you'll acquire a solid knowledge base and can go on to face 16-bit microprocessors and even a mainframe computer (the 6809 is more than powerful enough to give you this base). Better than that, you'll have no trouble stepping down to any of the other eight-bit MPU chips such as the 6502, the 8080, or even the Z-80, and all those other chips with a lower IQ. And I say that as a convert from an MPU that I still program extensively; the Z-80, once considered the most powerful of all eight-bit MPU's. This powerful 6809 chip is the heart of your Color Computer.

The hardware inside your machine is also impressive. The 6809 is a product of Motorola; in fact an interrelated family of Motorola chips comprise the core of the Color Computer. All these chips are

capable of doing work on their own in other hardware, but they function best when in harmony with one another. Under the hood of your machine, you have chips that provide you with the following goodies:

- High speed cassette input/output (I/O): at 1500 baud, the computer can transfer data at a rate of more than 187 bytes per second — that's 1500 (baud) divided by eight (bits per byte). If you can type faster than that, get yourself a Cray supercomputer and plug your brain straight in.
- Graphics of the utmost variety ranging from low resolution with eight colors (nine including black), to a two-color high-resolution mode 256 pixel dots wide by 192 deep. This can lead to some dazzling displays, and one of those clever chips — the video display generator (VDG) makes it all possible.
- Sound output from a number of different sources; two from inside the computer and one from a cartridge plugged in at the side. Great for whizzes, pops, grinds, thumps, bangs, or more serious audio prompts to a program user.
- Digital to analog (D/A) and analog to digital (A/D) conversions, which means it's possible for the Color Computer to "read" and "write" external voltages, thereby interacting with the outside world. (Dennis Kitz tells you how in the April issue.) These voltages vary constantly and are thus an analog of the quantities they represent. A few examples might include barometric pressure, temperature, wind, or speed — anything that can be represented by a voltage. That should give a few people an idea or

two. Remember that you heard it here first!

■ Joystick input: not much needs to be said about these except that the human race owes their continuing survival as a species to these devices. Without them, we would long ago have suffered a thousandfold massacres by marauding coin-op aliens, and baddies of all descriptions. Armed with joysticks you can save the universe and lots of quarters.

■ RS-232 I/O port: Yet another method of interacting with the outside world, but using a digital signal instead of analog. The RS-232, being the standard it purports to be, lets you link up and talk to information sources including other computers (even, dare I say it, non-Color Computers).

■ A cartridge slot (for ROMpaks), which serves to make the operation of the Color Computer completely automatic in a dedicated mode such as a game, a word processor, a data base program, or anything that can be mass-produced into the cartridge's Read-Only-Memory (ROM).

As well as all these goodies, unbeknownst to you, somewhere in the darkest reaches of your computer is a friendly little chip called a SAM (Synchronous Address Multiplexer). I say little; in fact it's a 40-pin large scale integrated circuit (LSI) of monstrous proportions compared with the normal fledgling 14-pin chips that comprise the hardware of many earlier microcomputers. This chip keeps all the hardworking memory chips refreshed. The memory needs refreshing because it's made up of a set of dynamic chips that would get tired and forget everything if they weren't constantly refreshed. True, every word of it, and your SAM chip takes care of this and a couple of other electronic chores without bothering the user/owner/programmer in any way.

The cartridge slot itself (without a cartridge in it) is an incredible device. Besides its normal use as an external program port, it lets you connect up to four disk drives, or it can entirely commandeer the internal circuitry of the machine, making it totally independent of the 6809. This makes it possible, for instance, to hook up two Color Computers in such a way as to give each one control over the other. That way they can talk to each other, make friends, get married (if appropriate) and maybe even make other Color Computers (assuming the availability of some robotic protuberances). Quite seriously, this slot gives inquisitive hardware boffins an electronic

Please turn to page 10

THE COMPOSER

Speech Systems, a manufacturer of speech, music, and sound effect synthesizers for the SS-50 bus, introduces THE COMPOSER for the Color Computer. THE COMPOSER is a 4 voice music compiler which allows one to easily develop music.

Each voice uses its own waveshape table. Both a BASIC and a machine language program are included, no additional hardware is necessary. THE COMPOSER allows the original musical score to be saved. In addition, the compiled music may be saved and best of all it may be played without any other software. Examples of how the Color Computer can be used to reproduce sound effects are also included. You have to hear the difference to really compare, but just look at some of these features:

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NY residents add sales tax

entry into the machine that unleashes infinite possibilities.

If the 6809 is the heart of the machine, then the ROM must be the brains. It's this Read-Only-Memory that determines how the thing behaves when switched on. This is where Extended Basic comes in as it's this that resides in the two 8K ROM chips inside the computer. If you have only one 8K ROM chip, then you're the proud owner of Color Basic without the extensions. In this case, you're cheating yourself — you have a Porsche with a Pinto engine. (And if you have 16K of RAM, then you only have a four-gallon gas tank!) Even though unextended Basic is quite powerful and useful in its own right, it doesn't allow the full personality of the Color Computer to reveal itself.

With Extended Basic you have all the facilities of Color Basic . . . and then some. The SOUND command lets you play a tone of defined pitch and duration; the PLAY command lets you play musical notes with variations in octave, pitch, length, and tempo. These parameters are interpreted from within a string of characters in Basic. The string contains all the details of the notes and pauses you want played, and can be manipulated like any other string in Basic — change the contents of the string variable and you change the music. It's as though the PLAY command uses the string to contain its own musical sub-language — an interpreter within an interpreter.

As a matter of interest to any Sherlock Holmes out there, take a look at the Basic commands on the highly touted (and priced) IBM personal computer. You'll find the odd similarity between it and the Color Computer as they are both Microsoft Basic interpreters with Microsoft's own special sound and graphics routines. In fact, certain things in the DRAW and PLAY commands that are documented on the IBM also work on the Color Computer, even though they're not mentioned in the manual. Try some experiments — you can't break anything. Then see who needs an IBM.

By singling out the star qualities, I could go on much longer singing the praises of this machine but I consider I've made my point even by only scratching the surface. There's obviously much more to this machine than meets the eye. I hope you non-owners are either ashamed of yourselves or on your way to the store to buy one. Personally, I've so convinced myself that I may just get another! In the meantime, to all us Color Computer owners; the devotees, the initiated, the elite, here's a toast. Congratulations! you've bought an incredible machine!

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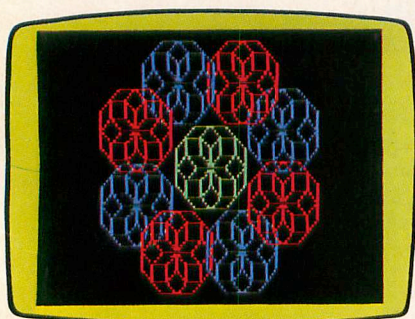
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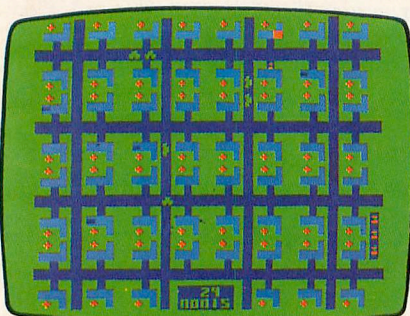
- A Primer Programming Language for Youngsters and Pre-Schoolers
- Helps Children Develop Problem-Solving Skills

Discover Color LOGO

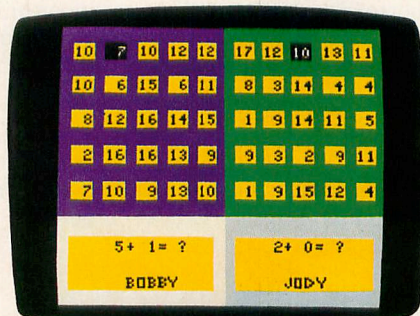
Fun to Learn, Easy to Use. Our Color LOGO programming language is designed to help students grasp fundamental programming concepts. Through manipulation of "turtle" graphics, students learn to write simple programs. The computer becomes a friendly learning tool, and students are prepared for more advanced concepts. Children under reading age can use a "doodle" mode to create graphics. And a "hatch" command creates multiple turtles, capable of running separate programs simultaneously. **49⁹⁵**
Cat. No. 26-2722



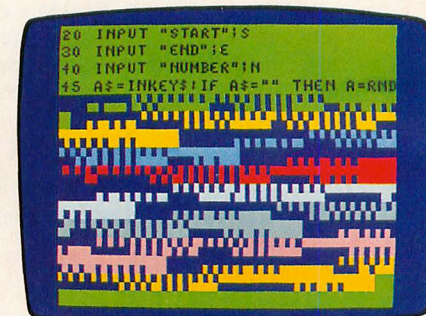
Mega-Bug. It's a maze of fun as you run from the little "buggers" hot on your trail. You eat white dots, leaving a trail of dots behind you. Win by leaving false trails and eating all the dots. 26-3076 **34⁹⁵**



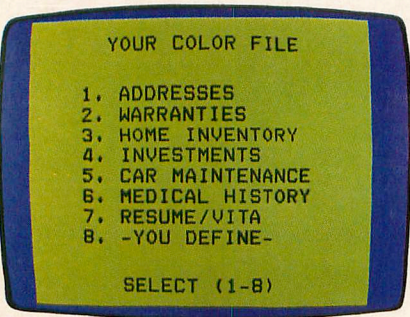
Poltergeist* Based on Steven Spielberg's hit movie! To have a "ghost" of a chance of saving Carol Anne, you must find the clues, climb the stairs, and destroy the poltergeist. 26-3073 **34⁹⁵**



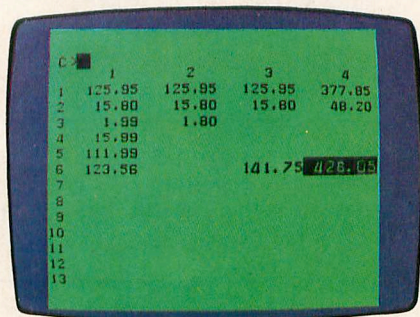
Bingo Math. Kids improve their arithmetic skills while competing against each other or themselves. Solve problems to score a Bingo! Also includes Speed Math and Number Hunt. 26-3150 **29⁹⁵**



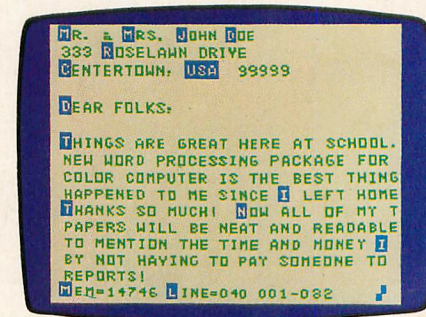
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Color File. Quickly and easily store and retrieve various types of important data—names, inventories, warranties, etc. Alphabetize, select, examine, print, change and save your information. 26-3103 **29⁹⁵**



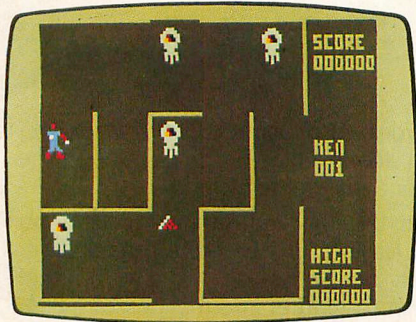
Spectaculator. Do forecasting and problem-solving with this "electronic spreadsheet"! Just enter numbers and formulas, and Spectaculator will calculate and display the results. 26-3104 **39⁹⁵**



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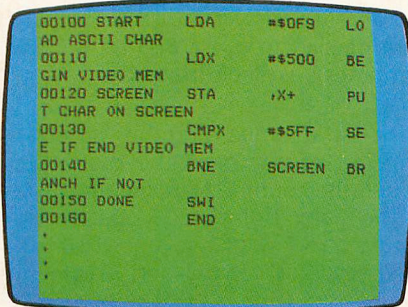
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Hello World!

by Bob Rosen

YOUR COLOR COMPUTER can give your telephone a whole new dimension. By connecting your Color Computer to a modem and communications software package, you're just a phone call away from the fast-growing world of telecommunications.

A modem (MODulator/DEMODulator) is an electronic device that converts the computer's impulses, bit by bit, into audible sounds that can be transmitted over the phone lines.

Two types of modems are currently available, the direct-connect modem and the acoustic-coupled modem. The direct-connect unit connects directly to your phone lines. The Radio Shack DC Modem I (RS Cat. #26-1172) lets you unplug your phone from the jack and plug it into their unit. Then you plug the cable from the Modem I back into your phone jack. This method assumes that your phone and jack are modular. If not, Radio Shack sells two adaptors (RS Cat. #279-393 and #279-351) to convert your hook-up to modular. Since the direct-connect unit connects to the phone line, external noises will not interfere with your transmission.

The acoustic-coupled modem is even easier to use, but is more susceptible to line noise. To use this modem, you place your telephone receiver directly into the modem's two cups and you're in business. The drawbacks are possible weak long distance signals and interference from someone else in your house playing the stereo too loud or watching TV.

Some modern phones don't fit the modem's circular cups (i.e. slimline phones). The acoustic-coupled modem is more flexible for use with multi-line phone systems than the DC Modem I because all you do is push buttons to use the modem on another line. You'll need a serial cable for your modem to connect it to your computer's RS-232 port.

For Radio Shack modems, you'll need a 4-pin DIN to 4-pin DIN cable. For non-Radio Shack modems, use a 4-pin DIN to DB25 cable (RS Cat. #26-3020 and #26-3014, respectively).

Now that you have the hardware, you'll need software. Again, two types of software are available. Radio Shack sells a dumb terminal package version under the Videotex name (catalog number 26-2222) and includes one free hour on the Dow Jones and CompuServe networks. The software allows access to these networks.

A smart terminal can take the information you access from a telecommunications system and store it in your computer's memory. After you go off-line from a system, you have the option of a print-out or writing it as a cassette or disk file. Or, you can type a message off-line and then upload with a single keystroke to the host computer.

Since networks such as CompuServe and The Source charge for their services, this method saves you money as it transmits faster than you can type and it lets you check for errors while off-line. The smart terminal program also lets you change any RS-232 or printer parameter. For example, you can access half duplex systems and use 1200-baud modems. You can run your printer at 1200 baud and insert a carriage return after a line feed. A smart terminal program offers another bonus, you can scroll on-line or off-line up to 12 lines at a time.

Equipped with your communications hardware and software you can access data bases of all types. Aside from the big data bases, like CompuServe and The Source that charge for their services, a new phenomena has bloomed called Bulletin Board Services (BBS).

A Bulletin Board Service consists of an individual with a personal computer and an auto-answer modem set up to have outside callers access their computer.

Accessing most BBS systems is free. Most systems offer a variety of features. A partial listing includes a message retrieval section, a downloading section, a merchandising section, and a color graphics section. With a smart terminal package, you can capture files from the download section and save them to disk or tape. These files are usually games and

utilities. Also, as an added feature, you can access Color Graphics through the phone lines right onto your TV set.

In the message retrieval section you can leave or retrieve messages with other users of the system. It is a way to get Color Computer information not readily available through other channels. You can ask technical questions, get opinions on Color Computer hardware and software, or place an ad. The merchandise section has lists and descriptions of products from the leading Color Computer advertisers.

These private BBS often serve as good sources of computer peripherals. My BBS, Connection-80 of Woodhaven was the first BBS dedicated to the Color Computer. In addition to selling products manufactured elsewhere, such as Eigen Systems' ColorCom/E, my company, Spectrum Projects, has expanded into the manufacturing of our own products. These products are developed by knowing what is needed. For instance, we sell a printer/modem extension cable that extends your Radio Shack cable an extra 15 feet. To use your modem and printer at the same time we sell a Y-adaptor cable. It's a profitable business. One that's easier to start than you might think.

To run your own BBS you'll need a 64K RAM Color Computer, two disk drives, and an auto-answer modem. The software needed to run a BBS on a Color Computer is available from different vendors.

The list accompanying this article is a sampling of some of the many BBS around the country. Next month's issue of The Color Computer Magazine will feature a review of two smart terminal packages, ColorCom/E and ColorTerm 1.1.

Bulletin Boards are profitable, as I can attest. Just imagine sitting in front of your Color Computer BBS and watching it accessed at any time of day or night from anywhere in the world. Make way for the bulletin board system — the wave of the future. ■ ■ ■

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Woodhaven, NY
(212) 441-3755 and (212) 441-3766
Sysop: Bob Rosen (Spectrum Projects)

Silicon Rainbow BBS

Synnyvale, CA
(408) SEE-6809
Sysop: Shawn Jipp (Silicon Rainbow Products)

MACC-NET

Kansas City, MO
(816) 358-6222
Sysop: Steve Odneal

NC Software

Minneapolis, MN
(612) 533-1957
Sysop: Bob Shaw

Morning Star Color BBS

Napa, CA
(707) 257-1485
Sysop: Phil Rusin

CoCo Board BBS

Atlanta, GA
(404) 378-4410
Sysop: Lee Blitch

Metro West Data Base

Wheaton, IL
(312) 260-0640
Sysop: Terry Haas

Color Connection

Elgin, TX
(512) 285-5028
Sysop: Peter Banz

Bulletin 68

Atlanta, GA
(404) 929-0680
Sysop: Wayne Ash

Flexnet

Oklahoma
(405) 722-6809
Sysops: Roger Walton and R.L. Hilbun

6809 Micro Journal Board

Hixson, TN
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Sysops: Don and Tom Williams

OS/9 Board

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Sysop: George Dornier

Los Angeles Color Exchange

Los Angeles, CA
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Sysop: Don Brown

NYBBLES/80

New York, NY
(212) 626-0375
Sysop: Stony Clove Computer Center

Outpost 80

New York, NY
(212) 836-3019

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16K
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Disk
Basic



Stash a Directory

THE VANISHING directory happens to most disk systems. The Color Computer is about average in reliability, but thanks to the designers of the operating system we can make it relatively bomb-proof. My DIRSAV and DIRGET programs are simple Basic bomb shelters.

Manuals discuss the need for backup disks in great detail, but my crashes always seem to happen about five minutes before I was going to make a backup. DIRSAV/DIRGET is not a substitute for backups, but it will help keep your disks safe until you do back them up.

Disks are divided into 35 circular tracks, and each track has 18 sectors 20 degrees wide. A sector stores up to 256 bytes of data. The final building block is the gran, which is half a track or nine sectors. User storage of programs or data is done by grans — when you call ?FREE(0) the answer always appears as grans.

A fresh disk shows 68 grans free for the user, but the disk has 70 grans in all. You're not being cheated — the other two are reserved for the directory. Since you use the directory so often, common sense suggests it should be in the middle of the disk, and sure enough, the manual says it occupies track 17.

Track 17, sector 2 is the map showing busy/free status for all user grans. Sometimes called the allocator, it's the most important sector on the disk because it tells the system the location of every program and data file. An entry of FF shows the gran is free, other entries show how many sectors are used, or the next gran if all sectors are used. (Note that only the 68 user grans are mapped — the directory is always busy.)

Each time you write information to the disk the system updates the map, and each time it reads a file, the system consults the map.

Sectors 3, 4, and 5 in track 17 contain file names, type of file, file size, and starting gran of the program or data file. Saving or loading files updates this information for the requested file.

Due to these directory operations, the disk head spends a lot of time on the directory track, and Murphy's Law assures us that when a glitch occurs it will write

by Douglas Swank

bad information to the directory. Error-checking routines verify that all data read from the disk is correct. If one bad bit has been written to the disk map, the system refuses to do anything at all with this disk. In scientific terms, this is called *Tough Luck Charliensis*, or *Diskmappus Wreckus*.

All the data is still on disk, but you can't find any of it because you can't read the map. Power line sags, system glitches, maybe even cosmic rays or UFO's . . . but once in a while a bad bit shows up on the disk and the result is a trashed directory.

A few weeks ago I had a run of bad luck. After losing the third disk I remembered a system I use at work that keeps a spare directory hidden away. If the first directory gets lost or damaged, the computer gets the spare and rewrites the damage. I decided my Color Computer should also keep a spare. I braced myself for a bout of machine language programming, but a look at the disk manual relieved me by explaining the directory format. The Basic commands DSKI\$ and DSKO\$ let you go in and tamper with all the data on the disk — including the directory.

Where should you put a spare directory? A new disk shows that user grans are assigned from the center outward, so the ends are least likely to be used (unless the disk is completely full already).

You need to make the spare directory area busy on the map so the system won't write something else over it. Having picked gran 68, you read the map with DSKI\$, make the 68th entry C6 instead of FF, and write it back to the map with DSKO\$. It won't show on the directory, but if you read the fresh disk you'll find only 67 user grans free.

You have now arrived at the first three lines of DIRSAV. (Loud cries of about time from the audience.) The first line reads the map, the second makes gran 68 busy, and the third line writes the new map back in its usual place. The following lines read sectors of the map and directory and copy them up to gran 68.

Note that DSKI\$ and DSKO\$ are letters not numbers.

DIRSAV has no music, and no graphics, nothing at all except some buzzing from the disk drive. The payoff comes next week when your directory gets trashed . . . instead of rewriting the entire disk, you smile, load DIRGET, and replace the damaged area.

DIRSAV should be on each work disk. You can call it from the keyboard or from other Basic programs at signoff, and if used frequently will keep a fresh directory stored away. If the work display has only one program, add DIRSAV to the signoff portion. Anything put on the disk after DIRSAV's last use can't be recovered if the directory gets trashed.

The other half of the routine, DIRGET, rewrites the directory after it gets ruined. Keep several copies of DIRGET on other disks, perhaps your utility disks (when the directory gets ruined you'll have to get the recovery program from another disk). Operating DIRGET is DIRSAV in reverse, it gets the spare from gran 68 and plugs it into the real directory area. Nine times out of 10 this restores your disk to normal. Remember, files that were changed after you stored the spare will reappear as earlier versions, or perhaps as junk. The first time you use this program, it repays the few minutes it took to install and use.

Typos and typing errors creep into even short programs, so try this out several times on a dummy disk. If the program is wrong, the result will probably be a trashed directory.

Observant readers will note that a whole track (18 sectors) has been reserved for the directory, but only five sectors are used. You could hide data or the spare directory here, but I suspect Tandy reserved the area for future expansion.

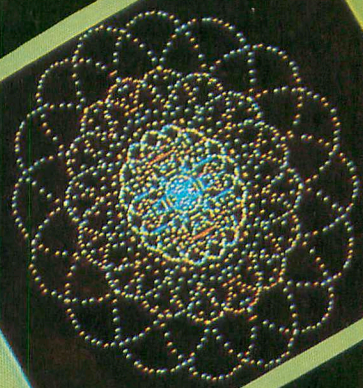
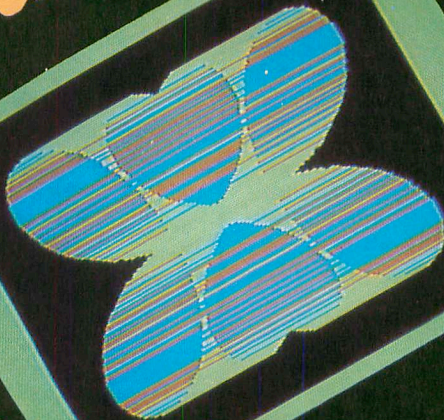
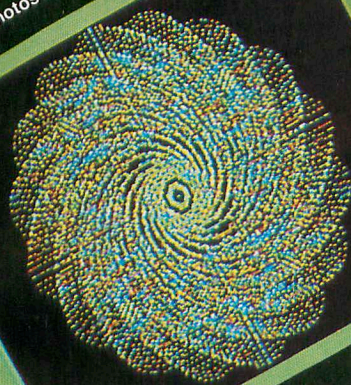
My single-drive system doesn't seem to use the empty sectors for anything. Multi-drive users should do a little testing before they use them. The empty sectors would be an invisible hiding place for data files, at the user's risk.

Good luck to all DIRSAV users, and I hope you recover your files when your directory gets trashed. ■ ■ ■

Listing begins page 18

Ready to Run

Computer art by Jake Commander
Photos by Charles Freiberg



Every issue of **THE COLOR COMPUTER MAGAZINE** comes packed with a wide range of specially designed programs ready for you to key in and run.

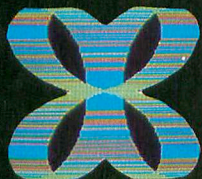
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Circle No. 13 on Reader Service Card

Program Listing 1

```
10 '
12 ' ** DIRECTORY STASH **
14 '
16 ' DIRSAV HIDES A SPARE
18 ' DIRECTORY UP IN GRAN 68.
20 '
22 ' DIRGET GETS THE SPARE AND
24 ' REWRITES THE REAL ONE.
26 '
30 ' -- BY DOUG SWANK --
32 ' WALTHAM, MASS. 1982
34 '
36 '
98 '
99 ' ** DIRSAV **
100 CLEAR 600:DSKI$0,17,2,A$,B$
110 MID$(A$,68,1)=CHR$(198)
120 DSKO$ 0, 17, 2, A$, B$
130 DSKO$ 0, 34, 11, A$, B$
140 DSKI$ 0, 17, 3, A$, B$
150 DSKO$ 0, 34, 12, A$, B$
160 DSKI$ 0, 17, 4, A$, B$
170 DSKO$ 0, 34, 13, A$, B$
180 DSKI$ 0, 17, 5, A$, B$
190 DSKO$ 0, 34, 14, A$, B$
200 DSKI$ 0, 17, 6, A$, B$
210 DSKO$ 0, 34, 15, A$, B$
220 DSKI$ 0, 17, 7, A$, B$
230 DSKO$ 0, 34, 16, A$, B$
240 END
```

Program Listing 2

```
250 '
297 ' ** DIRGET **
298 '
299 ' GETS THE SPARE!
300 CLEAR 600:DSKI$0,34,11,A$,B$
310 DSKO$ 0, 17, 2, A$, B$
320 DSKI$ 0, 34, 12, A$, B$
330 DSKO$ 0, 17, 3, A$, B$
340 DSKI$ 0, 34, 13, A$, B$
350 DSKO$ 0, 17, 4, A$, B$
360 DSKI$ 0, 34, 14, A$, B$
370 DSKO$ 0, 17, 5, A$, B$
380 DSKI$ 0, 34, 15, A$, B$
390 DSKO$ 0, 17, 6, A$, B$
400 DSKI$ 0, 34, 16, A$, B$
410 DSKO$ 0, 17, 7, A$, B$
420 END
430 '
440 'BEWARE OF I AND 1, O AND 0!
```


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By Tim Nelson

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ROMPAK: Text space	2.5K	16K 31K	N/A	N/A	N/A
DISK: Text space	N/A	5.5K 21.5K	N/A	0.5K	16.5K
Right Justify		YES		NO	
Video Window		YES		NO	
Edit any ASCII File		YES		NO	
Programmable Function		YES		NO	

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Chapter 7

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by William Barden Jr.

THE DRAW COMMAND draws a line from point 1 to point 2. The line may be drawn in an up direction, at 45 degrees, to the right, at 135 degrees, down, at 225 degrees, or left, at 315 degrees, as shown in Figure 1.

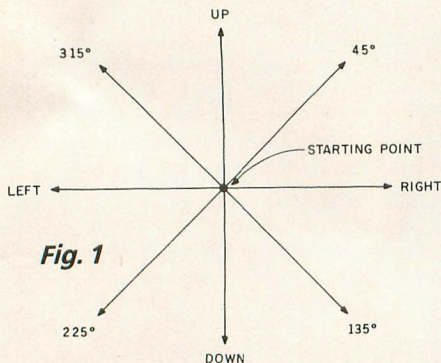


Fig. 1

The length of the line may be any number of units, from 0 to hundreds.

The DRAW command also includes the capability to move to a designated spot on the screen, specified in X, Y coordinates or in relative coordinates.

DRAW also has the provision of drawing a blank line (!) or changing the color.

The DRAW command uses a string of commands to indicate how the line should be drawn. A typical line might be defined as DRAW "up 25 units," "right 20 units," and so forth. Within the commands, DRAW may reference a substring of commands, a powerful feature that enables the user to build little modules of commands.

Another powerful DRAW feature is the ability to scale DRAW commands. This means that with a single command, DRAW may produce displays that are 1/4 scale, 1/2 scale, on up to 6 3/4 scale.

The DRAW command is really an order of magnitude more powerful than LINE, which was an order of magnitude more powerful than PSET! (which was an order of magnitude more powerful than SET, which was ...) We'll discuss all the ramifications of DRAW in this chapter.

Draw Format

The format of DRAW is DRAW

"string" or DRAW A\$

In the first case, "string" represents a string of DRAW commands; the string may be any number from one to dozens. A typical DRAW string might be

DRAW "D20: R25: U23"

where the string represents a line drawn from the current screen position, Down 20, Right 25, and then Up 23 positions. Note that the individual commands are separated by semicolons and that the entire line of command is a string with double quotation marks enclosing the line.

In the second case, A\$ represents a general string variable, which might be A\$, B\$, CC\$, YY\$, or some other legitimate name. This string variable in turn would define a string of valid DRAW commands.

DRAW Commands

DRAW commands are shown in Table 1. They include *motion* commands which result in a line segment being generated, *mode* commands which change the color, angle, or scaling, and two options, "no update" and "blank."

Table 1

Motion

- M = Move the cursor
- U = Move Up
- D = Move Down
- L = Move Left
- R = Move Right
- E = Move 45 degrees
- F = Move 135 degrees
- G = Move 225 degrees
- H = Move 315 degrees
- X = EXecute a substring

Mode

- C = Change Color
- A = Change Angle (rotate)
- S = Change Scale

Options

- N = No Update after draw action
- B = Draw Blank line (move, do not display)

M Command

The M command moves the imaginary cursor for the DRAW to a specified spot on the screen. Initially, this is done with the "B" (or Blank) option so that wherever the cursor is to start off, no line is generated in the move. Thereafter, an M command can be used with the B prefix or without.

To draw a line starting from 128,96 to 0,0 and then to 255,2, for example, the line is first positioned by BM 128,96 and then M0,0 and M255,2 are done to draw the lines. (See Figure 2).

```
100 REM DRAW EXAMPLE 1
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 DRAW "BM128,96;M0,0;
    M255,2"
150 GOTO 150
```

The M Command, therefore, is used to position the cursor or to draw a line between any two specified screen points. M will generate any angled line and draw the line in any direction depending upon the relationship of the start point to the ending point. Note that the screen points are explicitly identified in the format (B)MX,Y, where (B) indicates a Blank option.

Another form of the M command uses relative rather than absolute values for X

Fig. 2a

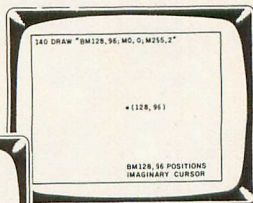


Fig. 2b

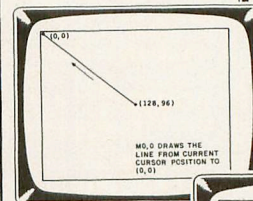
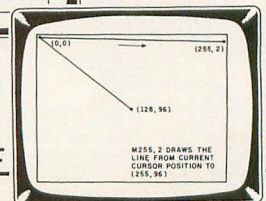


Fig. 2c

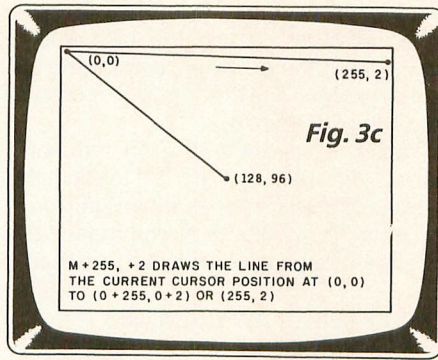


and Y. After the first M command is executed, the graphics cursor is in a known position. A Move may be done with a displacement from that known position to any other position. The displacement may be either negative or positive. The program above may be rewritten as

```
100 REM DRAW EXAMPLE 1
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 DRAW
    "BM128,96;M-128,-96;
    M+255,+2"
150 GOTO 150
```

This is a relative move. (Please, no jokes about the proximity of mothers-in-law.) The format for this type of relative move is (B)M + -XD, + -YD, where XD is the number of units to move in the X direction and YD is the number of units to move in the Y direction. The sign indicates the direction "+" is right for X and down for Y and "-" is left for X and up for Y. The displacement value will be added to the current cursor position, and the result will define the new point. The Y positive sign is optional in the above format; it's probably best, however, to always use a plus or negative sign when working in this format to avoid confusion.

In the above program, BM128,96 moved to 128,96 without writing a line. The next Move was M - 128, - 96 which gave the new value 128 - 128, 96 - 96, or 0,0. The next Move was M + 255, + 2 which gave the new value 0 + 255, 0 + 2, or 255,2. You can look at the rela-

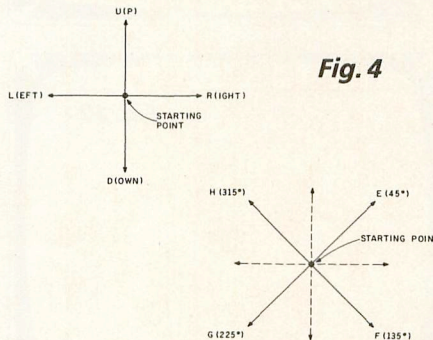


tive displacements, then, as either being added to the current cursor position, or moving in a "+" direction or "-" direction for X or Y.

Figure 3 shows the movements.

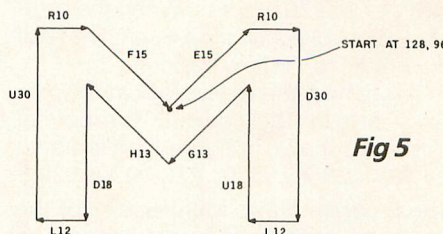
Other Motion Commands

The other motion commands are all relative commands that specify a relative displacement from the current cursor position. (Remember that the cursor is imaginary — it doesn't show up and we're using it only for convenience.) Up, Down, Right, and Left are easy to remember, as the first letter of each direction is used as an abbreviation for the command. E, F, G, and H fill in the gaps



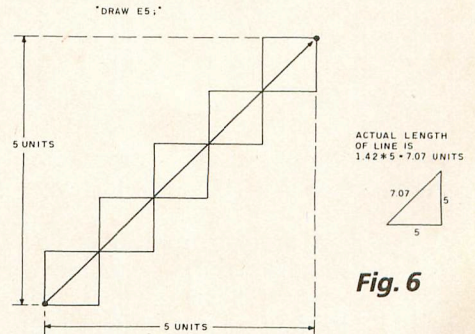
between these directions as shown in Figure 4.

These commands allow us to easily specify movement in eight directions. Since much graphics will involve drawing lines in this fashion, they are much more convenient to use than specifying a new Move command for each line segment. Suppose, for example, that we wanted



to draw a large letter M in the center of the screen, as shown in Figure 5. We could draw it very easily by using the DRAW motion commands:

```
100 REM DRAW EXAMPLE 3
110 MODE 3,1
120 SCREEN 1,0
130 PCLS
140 DRAW "BM128,96; E15; R10;
    D30; L12; U18; G13; H13; D18;
    L12; U30; R10; F15"
150 GOTO 150
```



About the only difficulty in using the DRAW motion commands is that the commands that specify motion in acute angles are referenced to the number of pixel units displaced horizontally or vertically. Remember that the number of units of length for a line drawn at a 45 degree angle is approximately 1.42 times the length of a vertical or horizontal line with the same displacement along the Y or X direction. See Figure 6.

The M command can easily be used to connect to any horizontal or vertical line, since you need only to know the horizontal or vertical displacement rather than the actual length of the angled line.

The Blank Command

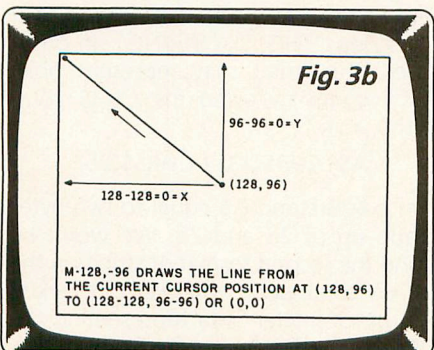
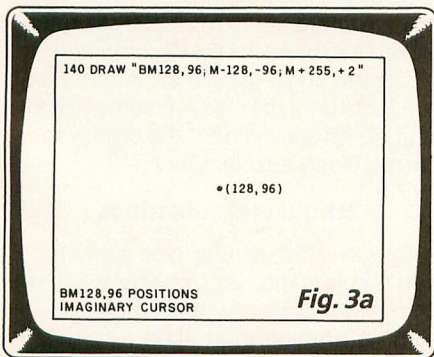
We saw the use of the Blank command used as a prefix for the Move command to effect a move without drawing a line. The B prefix may also be used before any motion command to blank out a line. Simply tack it on before the command as in "BH15;" in the above program. The line will still be drawn, but it will be blank. (Some of you will be able to relate this to the philosophical question about a tree falling in the woods with no one around. If a line is DRAWn with a Blank prefix, is it really drawn?)

An alternative way to use the Blank command is to use the B command separately, without prefixing another command. An example from above is

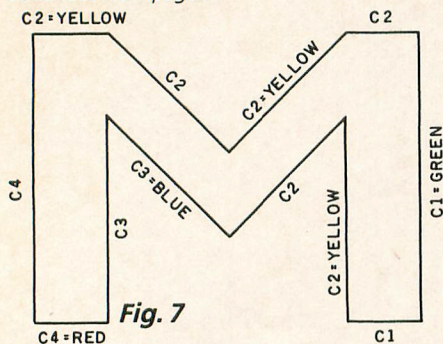
```
140 DRAW "BM128,96; E15; R10;
    D30; L12; U18; G13; B; H13;
    D18; L12; U30; R10; F15"
```

The Color Command

The C command is used at any time in the DRAW string to change the color of the following line. The format of C is Cx where x is a standard color code from 0 through 8. The Cx command is embed-



Continued from page 21



ded in the string just as the other commands are, with a semicolon following the Cx.

Using the M program from above, you can alternate colors on the line segments quite easily. As with all graphics, you have only the four colors of the color set to play with in PMODE 1 or PMODE 3.

```
100 REM DRAW EXAMPLE 3
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 DRAW "BM128,96; C2; E15;
R10; C1; D30; L12; C2; U18;
G13; C3; H13; D18; C4; L12;
U30; C2; R10; F15"
150 GOTO 150
```

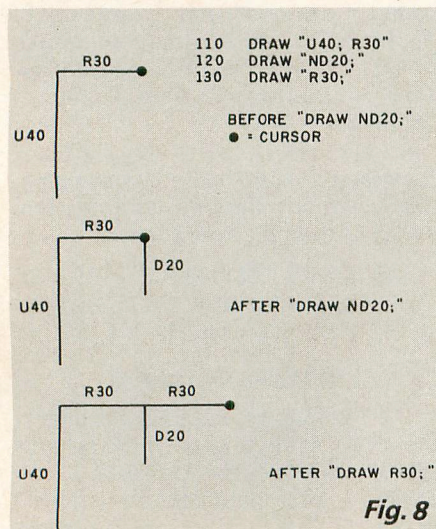
The colors for the M are as shown in Figure 7.

Once a color is specified by the C command, it will remain in force until the C command is encountered.

The No Update Command

The N, or No Update command, is another optional command that may be used similarly to the B command, either as a prefix to a motion command or as a separate command delimited by a semicolon.

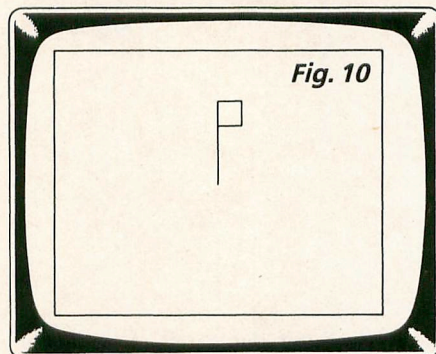
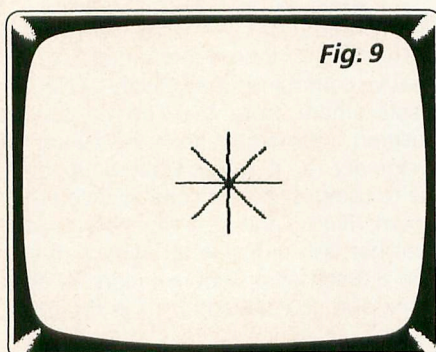
The N command allows the next motion command to be executed but pre-



vents it from updating the cursor position. In other words, the next line is drawn, but the cursor remains at the beginning of the line after the line is drawn, as shown in Figure 8.

We can see how the N command works in displaying a giant asterisk in the center of the screen, as shown in Figure 9. Both forms of the N command, the prefix and separate command, are used.

```
100 REM DRAW EXAMPLE 3
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 DRAW "BM128,96; NU40;
NR28; NR40; NF28; ND40;
NG28; NL40; NH28"
150 GOTO 150
```

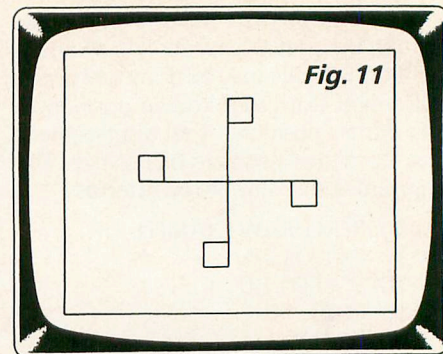


The Angle Command

The A, or Angle command, is somewhat of a misnomer. It is really a rotate command. The format of the command is Ax where x is 0, 1, 2, or 3, specifying rotations of 0 degrees, 90 degrees, 180 degrees, or 270 degrees. When the command is invoked, all subsequent lines will be rotated to the new position.

To see how this works, look at the program below. The figure in the normal position is shown in Figure 10. It is drawn by "BM128,96; U70; R20; D20; L20."

The program draws four versions of the figure by using four A commands. The first A command, A0, displays the figure in the 0 degree position. The A1 rotates the figure 90 degrees clockwise and displays it. The A2 rotates the figure 180 de-



grees and displays it. The A3 command rotates the figure 270 degrees and displays it. The final display is shown in Figure 11.

```
100 REM ROTATE PROGRAM
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 A$="BM128,96;U70;R20;
D20;L20"
150 DRAW "A0"+A$
160 GOSUB 1000
170 DRAW "A1"+A$
180 GOSUB 1000
190 DRAW "A2"+A$
200 GOSUB 1000
210 DRAW "A3"+A$
220 GOSUB 1000
230 GOTO 230
1000 FOR I=0 TO 1000:NEXT I
1010 RETURN
```

The subroutine in 1000 causes a slight delay between each rotation. Each DRAW command is a combination of a fixed string A\$ defining the figure and an A command in a string. The two strings are concatenated to form one string that is executed by each DRAW command.

The last angle used in the A command is in force until the next A command is executed. An A0 will reset the display to its normal 0 degree orientation.

Strings and Substrings

Before we discuss the next command, the X command, let's review what we know about strings and their use. A string is nothing more than a collection of bytes. Many times these bytes represent text characters in ASCII format as in the string "THIS IS A STRING". In other cases, the string may represent non-ASCII codes by using the CHR\$ command, as in

```
A$"CHR$(23)+CHRS$(25)
```

which sets string A\$ equal to two bytes made up of 23 and 25. We won't be using the second format of strings in the DRAW commands, where all of the data will be character data representing the DRAW commands found in Table 1.

A string defined by a statement such as

```
100 A$ = "THIS IS A STRING"
```

is a constant string. Any time A\$ is referenced, it will contain the same data.

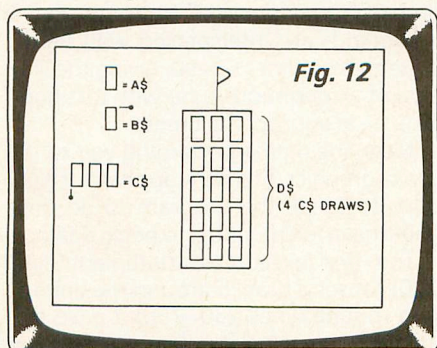
Strings can be concatenated, which is a fancy term for appending one string to the end of another string. When this is done, a new string is created. This new string may become a constant string or may simply be temporarily stored. C\$ below is a constant string of "THESE ARE THE PROGRAMS THAT TRY MEN'S SOULS", while the temporary string of "FIFTY FOUR FORTY OR FIGHT" disappears after it is displayed.

```
100 A$ = "THESE ARE THE PROGRAMS"
110 B$ = "THAT TRY MEN'S SOULS"
120 C$ = A$ + B$
130 D$ = "FIFTY-FOUR FORTY"
140 E$ = "OR FIGHT"
150 PRINT C$, D$ + E$
```

A *substring* in reference to the DRAW commands (a DRAW string?) means any constant string that has been defined previously and can be denoted by a string label, such as A\$, B\$, or Z1\$. A substring for DRAW may move to a new position, draw a series of lines, or change the color, just as we have seen in the above examples.

A substring may be called from within a DRAW string by means of the X command, execute substring. This means that one string can reference another string which can reference another string which can reference another string, and so on. When these strings define graphics figures, a whole series of modules may be made up to perform various graphics functions. We'll show you what we mean in the next program.

The program below draws a modest skyscraper, shown in Figure 12. It uses several substrings to perform the graphics. String A\$ defines a "window draw" of right 8, down 20, left 8, and up 20, as shown in the figure. Strings B\$ executes the window draw by "XA\$" and then moves the cursor over to the right 14 positions in preparation for the next window. String C\$ executes string B\$ by



"XB\$" three times, so it draws three windows and then moves over left 24 positions and down 24 positions in preparation for the next floor. String D\$ executes string C\$ to draw a floor of windows five times to draw the entire five floors of windows.

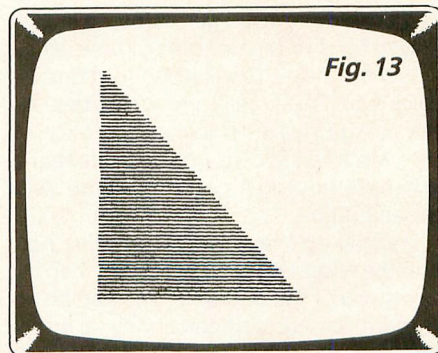
```
100 REM DRAW THE TANDY TOWER
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 A$ = "R8; D20; L8; U20"
150 B$ = "XA$; BR14"
160 C$ = "XB$; XB$; XB$; BL42; BD24"
170 D$ = "XC$; XC$; XC$; XC$; XC$;"
180 DRAW "BM94,36; R50; D124; L50; U124"
190 DRAW "BM100,40; XD$;"
200 DRAW "BM94,36; BR25; U60; F9; G9;"
210 GOTO 210
```

The actual drawing starts with line 170, which draws the building outline. Line 180 moves the cursor to 100,40 and then executes string XD\$ to draw all of the windows. Line 190 adds a flag to the top of the building.

There were five levels of graphics here! This simple example doesn't do the X command justice. Graphics can be shortened drastically whenever repetitive designs have to be drawn; they can be defined by a substring and executed at any time. Submodules of designs can easily be defined and used as building blocks to draw composite pictures. A very powerful command!

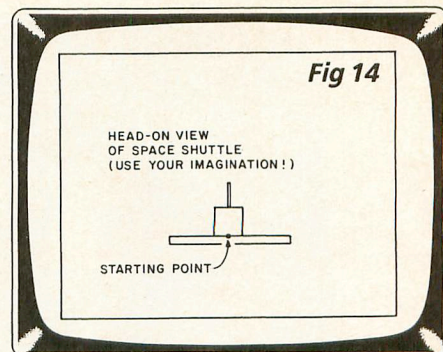
Scaling Up and Down

We're leaving the best commands until last. Scaling is another very powerful feature of the Draw command. It's



implemented by the S option. The format of S is (another complicated one) Sx where x is a value from 1 to 62 indicating the scale factor as shown in Figure 13.

As you can see from the figure, scale factors from 1/4 to 62/4 are possible. Scale factors under 1/4 result in displays that are



less than the dimensions as defined in the DRAW; scale factors greater than 1/4 result in enlarged displays.

To see how this works, look at the program above. It generates an oddly shaped figure (see Figure 14) vaguely reminiscent of a Space Shuttle in need of maintenance. The figure is defined by the A\$ string, which assumes a starting point in the midpoint of the figure. The actual DRAW command is in line 160, which uses a blue color ("C3") and starts at 128,136. The figure is drawn by executing the B\$ string followed by XA\$.

```
100 REM ANIMATION BY S
    COMMAND
110 PMODE 3,1
120 SCREEN 1,0
130 PCLS
140 A$ = "BL8; R16; D1: L16; U1; BR6; U4: R2; U4; D4; R2; D4"
150 FOR S = 1 TO 62
160 B$ = "S" + STR$(S)
170 DRAW "C3; BM128,136; XB$; XA$;"
180 FOR I = 1 TO 99/S: NEXT I
190 DRAW "C1; BM128,136; XB$; XA$;"
200 NEXT S
210 GOTO 210
```

The B\$ string is a constant string made up of "S" and the equivalent string value of the numeric variable S. The STR\$ function is used to convert the numeric variable S to a string which is then concatenated with "S" to form "S1", "S2", and so forth.

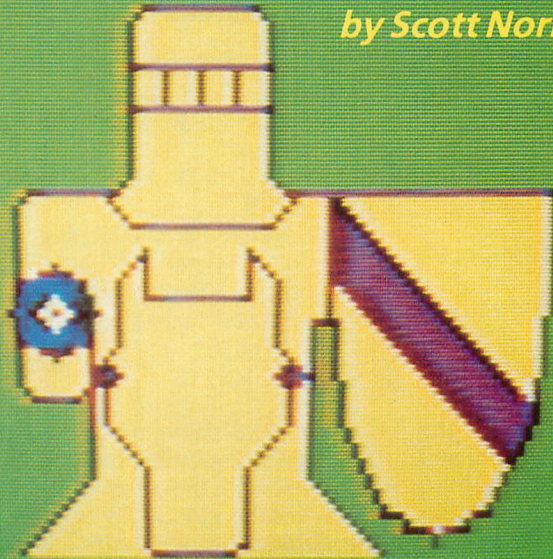
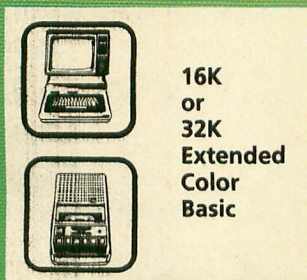
The B\$ string sets the scale factor which ranges from 1 to 62 in the loop from line 140 through 190.

After the figure is drawn in statement 160, a short time delay that decreases with larger scale factors is done in 170. Larger scale factors generate larger figures that take longer times to generate. After the time delay, the figure is erased by a second DRAW line that uses the background color ("C1"). The effect is of a figure getting larger and larger on the screen.

The S command can be used any time that a figure must be reduced or expanded — animation is just one use. ■ ■

Field of Honor

by Scott Norman



FIELD OF HONOR occupies 11.4K RAM, including six graphics pages and requires 32K and Extended Color Basic. I have also included changes to run Field of Honor on 16K machines. The game is simple enough, but the structure of the game is a little convoluted due to subroutines used for frequently-used operations. To reserve enough graphics memory for the game, enter a PCLEAR 6 from the command mode. An on-screen prompt reminds you in case you give the RUN command without reserving memory.

After the introduction, the computer asks you to pick an offensive strategy from a menu of points at which to aim your lance. You are then presented with a menu of defensive posture choices. After selecting offensive and defensive strategies, the program branches to a subroutine that DRAWS the jousting scene. This scene is a head-on view of your opponent with a couple of tents in the background. The same scene appears for each of the four opposing knights. The knights are distinguished through different decorative designs and color schemes on their shields; the fourth knight also has a distinctive helmet.

Due to the program's structure, the entire scene must be redrawn before your first meeting with each opponent. This takes about eight seconds, and the

"cover story" on the video display tells you that your computerized squire is looking after your horse, checking your armor, rousing your opponent, or giving you time to meditate before battle. There's nothing brilliant about this, but it's a useful technique for hidden graphics.

After the computer draws the scene, it requests a C (for Charge) input. The first image, a castle silhouette, appears for a few seconds while a short fanfare plays; then the animation starts. The three frames of animation are set up so that horse, rider, and lance bob up and down at different rates. The frames are displayed for different lengths of time, since actual harmonic (oscillatory) motions involve constantly changing velocities. As the charge nears its climax, the pace of the animation speeds up, and you hear a two-note hoofbeat pattern in time with the animation.

Flashing red and yellow screens indicate the final clash; the computer then informs you of the outcome. This can be an outright loss (accompanied by a Bronx cheer), a win (fanfare), or a draw. Any score under three points is a loss, six points indicate a win and anything in between is a draw. A draw gives you another chance at the same opponent, while a win advances you to the next opponent. Your fourth victory earns you the hand of the princess. But you're in for another

surprise; the king has two daughters and he never said which one would wed the victor. Your skill in battle plays no part in determining whether the beauty or the hag shows up at the wedding.

Line By Line

When you give the RUN command, the program reserves string space and dimensions a two-dimensional matrix MM. The strings are for the PLAY and DRAW statements, while MM stores a table of numbers to determine the outcome of each bout. All subsequent branches re-enter the program at a later point, so you'll have no problems with double-dimension errors.

Lines 20–170 set up the title display; strings A\$–D\$ constitute the first four lines of "Greensleeves." Notice the PLAY commands are interspersed with PRINT statements in lines 60–90, giving the illusion of a continuous tune with text popping up at appropriate times.

Next, the message warning you to reserve graphics memory appears. If you have to Break the program to do this, you'll have to enter RUN to begin again.

The first executable statement (line 220) causes a branch around the animation routine (lines 230–750). I gave the animation routine low line numbers so

the Basic interpreter could find them easily each time to draw the jousting displays. The first statements executed in an actual game are those that set up the situation display (lines 769–790). This peculiar format is necessary for a proper arrangement on the Color Computer's 32-column screen. While you read the text, the computer reads the six DATA statements that load the outcome matrix MM. The program then branches to the key-sensing subroutine at line 1890. The DATA statements are read so quickly, the keypress prompt appears before you have finished reading the opening text.

The drawing and animation routines are called from within a large FOR...NEXT loop between lines 880 and 1770; these lines contain the heart of the program, the jousting tournament.

Two variables govern the flow of play; A, the identification number of your opponent (1–4) and BN, which tallies how many bouts you have fought with any one foe. The tournament begins with the identification message appropriate to the first opponent, and the menu of offensive strategies. Selecting one brings up the defensive strategy menu. Add these lines to your program as an error-trap

```
1055 IF C < OR C > 5 THEN 1050
1057 BN = BN + 1
```

and delete the BN = BN + 1 from line 1050. The variables B and C that represent your strategy choices can be used later as coordinates for MM.

The byte counter increments after you choose your strategies. BN isn't declared zero at the outset; the Basic interpreter takes care of that when it encounters it for the first time in line 1057.

If this is your first bout, you see a "Wait" message as the computer branches to the DRAWing routine. Notice the RND(-TIMER) in the random-choice routines. The standard RND command generates a random sequence of digits, but without this command, the same sequence would appear every time you played the game. Using the negative number first reseeds the sequence, and guarantees the maximum randomization.

Line 1140 causes a GOSUB back to the graphics routine at line 230 — the one bypassed at the start of the game.

Since this is the first bout with a particular opponent, BN = 1 and all three frames are drawn. In later bouts, you'll see a "Good Luck" message before the game starts. A nested FOR...NEXT loop between lines 230 and 580 draws the message; it takes place off-screen, while the screen displays the text message. Lines 230 and 240 set up the required

graphics pages without including a SCREEN 1,n command to display them.

I chose PMODE 1, one of the four-color graphics modes of Extended Color Basic, for the animation. With 128 by 96 addressable points per image, it represents a compromise between detail and color opportunities. PMODE 1 requires two video pages per image, so the three frames of the jousting sequence require PCLEAR 6 to reserve sufficient video memory.

Many of the available commands — DRAW, LINE, CIRCLE and PAINT — ease the image creation process.

Lines 250–260 show the incorporation of a variable into a DRAW command, where the computer draws the rectangular top of a knight's shield. The shield will bob up and down in the three frames, so you'll need a variable vertical coordinate.

The first statement in line 250 calculates the vertical starting point for the rectangular shield section as 128, 112, and 96 for the three frames, the second half of that line converts the coordinate to a string. Line 260 shows how to incorporate this string into the appropriate DRAW command. I used the numerical value of the variable coordinate in several other places: line 260, which constructs the semi-ellipse forming the bottom of the shield, and in the commands for coloring the designs on the different shields.

By changing the functional relationship between frame number (P) and vertical coordinate, you can change the extent of the apparent motion. The shield and lance (line 530) use 8*P, the knight's outline (lines 410–500) uses 6*P, and the head of his noble steed (lines 510–520) bobs up and down by a 4*P variation. The result is loose animation, which gives the impression that more motion is going on than is actually the case.

The knight's helmet, visor, and collar come from lines 540 and 560, the horse's eyes are drawn in line 560, and the jousting field's tents are drawn in line 570. After the drawing, the computer prints the message in line 590 and waits for the order to charge.

Lines 640–740 handle the sound and light show. In 640 I have defined a variable Z that counts the number of times the complete up-and-down sequence of horse and rider has been presented. Line 720 tests to decide whether to terminate the routine and return to the main program. The animation involves a series of calls to a short subroutine (lines 730–750) where the identity of the displayed page and the length of time it appears are allowed to vary. The result is that the pace of animation accelerates. The two-

note hoofbeat of line 680, which sounds at the peak of each cycle of motion, plays at a constant tempo; the interval between hoofbeats shortens as the pace of the action quickens.

After the animated sequence, control returns to the main program at line 1150.

The variable SC, defined in line 1200 as the product of two factors added to a variable, scores the player for any given bout. The two multiplicative factors are the matrix element MM(B,C), representing the value given to the player's choice of offensive and defensive strategies, and an element that represents the increasing strength of successive opponents. This can be any function that decreases with increasing A (the opponent's identification number), to make it harder to acquire a large score. I chose the square root of (5–A) for this function. The additive term, R, represents luck; here it assumes the values 0 and 1 at random.

Once you have a method for assigning point values to the outcome of a bout, you need to assign win, lose, and draw criteria; lines 1210 and 1450 show the ones I used.

After calculating the score, the program gives you appropriate messages and sound effects. This code occupies lines 1210–1940. If you "draw," pressing any key returns you to the "Charge" portion of the program. If you defeat all four opponents, Field of Honor enters the reward section (lines 1950–2160). The program randomly selects which of the king's daughters you have won and draws her portrait in PMODE 3.

Changes for 16K Field of Honor

To run the program in 16K, I switched from three frames of animation to two, saving two graphics pages, or about 3K. Change the phrase FOR P=1 TO 5 in lines 230, 650, and 690 to P=1 TO 3. This removes the necessity to reserve six graphics pages with the PCLEAR 6 command.

I also eliminated the musical opening and the warning to reserve graphics memory. The 16K version lacks everything up to line 220 of the 32K version and begins instead at line 200. Add these lines for a 16K Field of Honor

```
200 CLS: DIM MM(6,5): PRINT@135,
"FIELD OF HONOR";
210 FORT = 1 to 1500: NEXT
```

That's all you need to play this game in 16K. With these modifications, the graphics are drawn faster since one-third of the images are gone. ■ ■ ■

Listing begins page 26


```

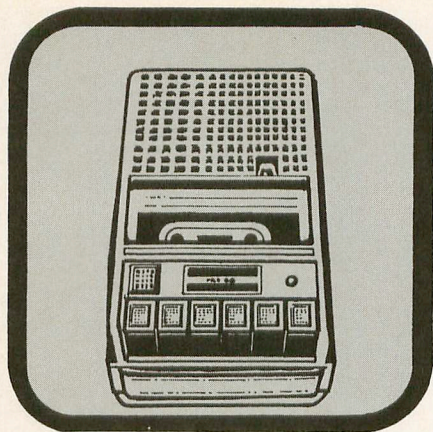
590 CLS:PRINT@167,"GOOD LUCK, M'LORD!":PRINT@231,"PRESS <C> TO CH
ARGE"
600 IFINKEYS<>"C"THEN600
610 PMODEL1,1:SCREEN1,0
620 M$="T2L1603AL404C":PLAY"XMS;XMS;"
630 FORT=1TO500:NEXT
640 Z=1
650 FORP=1TO5STEP2
660 GOSUB730
670 NEXT
680 PLAY"L32O2CE"
690 FORP=5TO1STEP-2
700 GOSUB730
710 NEXT
720 Z=Z+1:IFZ<9THEN650ELSERETURN
730 PMODEL1,P:SCREEN1,0
740 FORT=1TO10*P/Z:NEXT
750 RETURN
760 CLS:PRINT" YOU ARE A MEDIEVAL KNIGHT"
770 PRINT"IN A JOUSTING TOURNAMENT, HOPING TO WIN THE PRINCESS'S H
AND IN MARRIAGE."
780 PRINT" TO WIN, YOU MUST DEFEAT FOUR OTHER KNIGHTS IN BATTLE
"
790 PRINT" BEWARE! YOUR OPPONENTS WILL BECOME TOUGHER AND MORE
CRAFTY AS YOU ADVANCE IN THE COMBAT."
800 FORB=1 TO6
810 FORC=1 TO5
820 READ MM(B,C)
830 NEXTC
840 NEXTB
850 RESTORE
860 GOSUB1890
870 CLS
880 FORA=1TO4
890 ONA GOTO900,910,920,930
900 PRINT" THIS IS YOUR FIRST JOUST. YOU ARE UP AGAINST SIR
FREDERICK THE FILTHY.":GOTO940
910 PRINT" THIS IS YOUR SECOND JOUST. YOUR FOE: LORD CLIVE TH
E CREEP.":GOTO940
920 PRINT" YOU ARE DOING WELL! YOUR THIRD BOUT IS AGAINST B
ARON RUDOLPH THE RAT.":GOTO940
930 PRINT"THIS IS YOUR FINAL TEST. IF YOU WIN THIS TIME, THE PRIN
CESS IS YOURS! YOUR OPPONENT IS THE DREADED, FIERCE, RED KNIG
HT."
940 PRINT" YOU MAY HONOURABLY AIM AT THE:"
950 PRINT"1) HELMET":PRINT"2) BREASTPLATE"
960 PRINT"3) UPPER LEFT OF SHIELD":PRINT"4) UPPER RIGHT OF SHIELD
"
970 PRINT"5) LOWER LEFT OF SHIELD":PRINT"6) LOWER RIGHT OF SHIELD
"
980 PRINT:INPUT"YOUR AIMING POINT (1-6)";B
990 IFB<1ORB>6THEN980
1000 CLS
1010 PRINT"HOW WILL YOU DEFEND YOURSELF?"
1020 PRINT:PRINT"1) LOWER HEAD AND CHARGE":PRINT"2) SHIELD HELD H
IGH"
1030 PRINT"3) SHIELD HELD LOW":PRINT"4) LEAN TOWARD YOUR FOE"
1040 PRINT"5) LEAN AWAY FROM YOUR FOE"
1050 PRINT:INPUT"WHAT IS YOUR CHOICE";C:BN=BN+1
1060 IFBN>1THEN1140
1070 R=RND(-TIMER):R=RND(5):CLS
1080 ON R GOTO 1090,1100,1110,1120,1130
1090 PRINT:PRINT" I WILL SEE TO YOUR HORSE AND ARMOUR; WAIT HER
E.":GOTO1140
1100 PRINT:PRINT" YE HAD BETTER REST HERE WHILE I SEE TO YOUR TH
INGS. THIS KNIGHT MAY BE TOUGHER THAN YE THINK!":GOTO1140
1110 PRINT:PRINT" YOU CAN'T FIGHT IN ARMOUR AS BATTERED AS THAT
I 'TIS A DIS- GRACE! WAIT WHILE I REPAIR IT.":GOTO1140
1120 PRINT:PRINT" THE BIG BUFFOON HASN'T LEFT HIS TENT YET. H
E MUST BE SORE AFRAID OF YE, SIRE! I'LL GO AND PETCH THE LOOT.":
GOTO1140
1130 PRINT:PRINT" YE HAD BEST USE THIS MOMENT TO STEEL YOURSEL
F FOR COMBAT, MY LORD. YOUR FOE MAY BE AN OAF, BUT I HEAR T
ELL HE CAN FIGHT!"
1140 GOSUB230
1150 SCREEN0,0:FORW=1TO3
1160 CLS4:FORT=1TO75:NEXT
1170 CLS2:FORT=1TO75:NEXT
1180 NEXT
1190 CLS:R=RND(TIMER):R=RND(2)-1
1200 SC=MM(B,C)*SQR(5-A)+R
1210 IF SC<3 THEN1260
1220 ' TIES OR WINS
1230 D=RND(-TIMER):D=RND(4)
1240 ON D GOTO 1280,1300,1320,1340
1250 ' LOSSES
1260 D=RND(-TIMER):D=RND(4)
1270 ON D GOTO 1360,1380,1400,1420
1280 PRINT"HE MISSED YOU!"
1290 S=0:GOTO1440
1300 PRINT"HE HIT YOUR SHIELD BUT HIS BLOW GLANCED OFF."
1310 S=0:GOTO1440
1320 PRINT"HE KNOCKED OFF YOUR HELM!!"
1330 S=3:GOTO1440
1340 PRINT"HE BROKE HIS LANCE."
1350 S=0:GOTO1440
1360 PRINT"HE HAS UNSEATED YOU (THUD)!"
1370 S=5:GOTO1440
1380 PRINT"HE HAS BROKEN HIS LANCE, INJURED AND UNSEATED YOU (OUCH
)!"
1390 S=5:GOTO1440
1400 PRINT"HE HAS INJURED AND UNSEATED YOU (CRASH)!"
1410 S=5:GOTO1440
1420 PRINT"HE HAS BROKEN HIS LANCE AND UNSEATED YOU (CLANG)!"
1430 S=5
1440 PRINT

```

```

1450 IF SC>=6 THEN 1500
1460 ' TIES OR LOSSES
1470 E=RND(-TIMER):E=RND(4)
1480 ON E GOTO 1520,1540,1560,1580
1490 ' WINS
1500 E=RND(-TIMER):E=RND(4)
1510 ON E GOTO 1600,1620,1640,1660
1520 PRINT"YOU MISSED HIM (HISS)!"
1530 T=0:GOTO1680
1540 PRINT"YOU HIT HIS SHIELD BUT YOUR BLOW GLANCED OFF."
1550 T=0:GOTO1680
1560 PRINT"YOU KNOCKED OFF HIS HELM (LOUD CHEERS)!"
1570 T=3:GOTO1680
1580 PRINT"YOU BROKE YOUR LANCE (CRACK...)"
1590 T=0:GOTO1680
1600 PRINT"YOU UNSEATED HIM (LOUD CHEERS AND HUZZAHS)!"
1610 T=5:GOTO1680
1620 PRINT"YOU BROKE YOUR LANCE, BUT UNSEATED AND INJURED YOU
R FOE!"
1630 T=5:GOTO1680
1640 PRINT"YOU HAVE INJURED AND UNSEATED YOUR OPPONENT!"
1650 T=5:GOTO1680
1660 PRINT"YOU BROKE YOUR LANCE BUT UNSEATED YOUR OPPONENT."
1670 T=5:GOTO1680
1680 IFS=T ANDS=0THEN1850
1690 IFS=T THEN1820
1700 IFS<T THEN1720
1710 IFS>T THEN1790
1720 PRINT
1730 PRINT"SIR, YOU HAVE WON THIS JOUST!":PLAY"L1603AL404C"
1740 PRINT
1750 IFA=4THEN1960
1760 GOSUB1890
1770 BN=0:NEXTA
1780 GOTO1950
1790 PRINT
1800 PRINT"TOO BAD, YOU LOST! HOPE YOUR INSURANCE WAS PAID UP.":
PLAY"OLLC"
1810 GOTO1920
1820 PRINT
1830 PRINT"TOO BAD, YOU HAVE BOTH LOST. AT LEAST YOUR HONOUR IS I
NTACT.":PLAY"L1603AL404CP32L16CL403A"
1840 GOTO1920
1850 PRINT
1860 PRINT"YOU MAY TRY AGAIN.":PLAY"L1604CL403A"
1870 GOSUB1890
1880 GOTO950
1890 PRINT@44B,"PRESS ANY KEY TO CONTINUE"
1900 IF INKEYS=""THEN1900
1910 CLS:RETURN
1920 PRINT
1930 PRINT"SORRY, BETTER LUCK NEXT JOUST!"
1940 GOTO2170
1950 PRINT
1960 PRINT"HOORAY! YOU ARE THE VICTOR!":PRINT:PLAY"XMS;XMS;XMS;"
"
1970 CLS:PRINT:PRINT"NOW THE KING WILL REWARD YOU WITH ONE OF
HIS DAUGHTERS' HANDS IN MARRIAGE."
1980 PRINT:PRINT" WHAT'S THAT? YOU DIDN'T KNOW THAT HE HAS TWO
DAUGHTERS? AH WELL, HE DOES. I WONDER WHICH YOU SHALL MARRY."
"
1990 PRINT:PRINT" BE PATIENT, SIRE. IT ALWAYS TAKES THESE WOMEN
FOREVER TO PREPARE."
2000 FORT=1TO3500:NEXT
2010 PMODEL3,1:PCLS5:COLOR6,5
2020 DRAW"S8;BM124,72;M+4,-3;M+4,-1;R8M+4,1;M+4,3;M+2,4;M-2,4;M+2
,8;M-3,8;M-2,2;M-4,2;L10H2;M-6,-2;M-2,-4;U6E2U4H2U2E4":' HEAD
2030 R=RND(-TIMER):R=RND(2)
2040 ON R GOTO2050,2100
2050 DRAW"BM+14,10;M+2,8;L4":DRAW"BM-5,3;R6D1M+4,-1;M+2,1;M-3,2;L
5M-5,-3":PAINT(150,117),7,6:' NOSE, LIPS
2060 CIRCLE(136,92),4,6:CIRCLE(164,92),4,6:PAINT(136,92),6,6:PAINT
(164,92),6,6:CIRCLE(140,92),16,8,.5,.6,.8:CIRCLE(168,92),16,8,.5
,.6,.8
2070 CIRCLE(146,96),44,6,1.1,.5,1:CIRCLE(254,96),64,6,1,.4,.5:CIR
CLE(214,96),40,6,1,.3,.5:CIRCLE(10,96),92,6,1,0,.11:CIRCLE(60,96)
,62,6,1,0,.2:PAINT(146,56),8,6:' HAIR
2080 DRAW"BM146,48;M-40,-15;M+18,35"
2090 GOTO2140
2100 DRAW"BM+12,6;F6M+2,4;D2M-6,-4":CIRCLE(152,116),12,7,.5,.5,1
:' NOSE, LIPS
2110 CIRCLE(140,88),4,6:CIRCLE(164,88),4,6:PAINT(140,88),6,6:PAINT
(164,88),6,6:CIRCLE(134,88),16,8,.5,.7,.9:CIRCLE(168,88),16,8,.5
,.6,.8:' EYES
2120 CIRCLE(146,96),44,6,1.1,.5,1:DRAW"BM102,96;R10":DRAW"BM190,
96;L8":PAINT(146,56),8,6:DRAW"C8;BM102,96;R10D16BL4BU4U12L2D16BL
2BU6G10":DRAW"C8;BM190,96;L8;BRD14BR2U16D16BR3BD2U18":
2130 DRAW"C6;BM146,48;M-32,-12;G8M+7,-5;M+12,24"
2140 CLS:PRINT:PRINT" AHA--":PRINT"HERE COMES THE BRIDE!":FORT=1
TO1000:NEXT
2150 SCREEN1,1
2160 PLAY"TL02L4CL8.FP32L16FP32L4F":FORT=1TO1500:NEXT
2170 CLS:PRINT:INPUT"DO YOU WANT TO FIGHT AGAIN?";ANS
2180 IFLEFTS(ANS,1)=""THEN BN=0ELSE2200
2190 GOTO220
2200 IFLEFTS(ANS,1)<"N"THEN2170
2210 CLS:PRINT:PRINT"YOU BLOODY COWARD!!"
2220 PRINT:PRINT"ARE YOU AFRAID OF A LITTLE PAIN AND DEATH?"
2230 PRINT:PRINTTAB(7)"**PIE ON YOU!**":PLAY"OLLC"
2240 GOTO2240
2250 DATA 1,4,4,2,1
2260 DATA 3,5,4,5,4
2270 DATA 2,4,3,2,1
2280 DATA 2,4,3,3,2
2290 DATA 5,3,4,2,1
2300 DATA 5,3,4,3,2

```



Your Basic DBM

by Paul Detwiler

GENERALLY SPEAKING, a data-base manager (DBM) is a computerized index file. Its uses are as varied as your record keeping needs: stamp collections, business files, Christmas card lists, recipes, and so on.

This DBM is not everything your computing heart desires. There is no print routine, no error trapping routine, and no fancy screen displays. If you ask for more records and fields than your RAM size can handle, you'll get an OM ERROR in line 540. So much for the minuses.

Basic DBM is totally RAM-based. This means two things: the amount of memory your computer has limits your file capacity (consider, though, that the entire program fits into less than 4K RAM leaving you plenty of room); and functions like searching and sorting will be fast—very fast.

The program works from two menus. The first menu, Create a File, gives you two options: Create a New File; or Load an Old File. Since to load an old file you have to have already used the program, we'll concentrate on creating a file.

The program requires little explanation to run, so I'll help you set up a sample data base and then leave you to experiment on your own.

Using the Program

Choose option 1 and name your file *Premiere Issue*. You are next asked how many fields. A field is a category within a file. Each record uses the same fields. We'll choose four fields for this file, so type in 3 and hit Enter.

Answer 9 for maximum number of records and press Enter. You are then asked to name your fields. Respond by typing *Author, Article, Category*; press Enter

after each field name. After answering all the appropriate questions you are presented with the second menu. Its options are: Input Data; Scan All Files; Delete Records; Sort Records; Save Files on Tape. Choose option 1 and press Enter. The computer asks *What is Author?* Type in *Jake Commander* and press Enter. Next, *What is Article?* Answer by typing *Congratulations . . .* For the last prompt, *What is Category?*, answer *General*.

To fill in the information for the remaining records answer: *Bob Rosen, BBS, Communications; Douglas Swank, Stash a Directory, Utility; William Barden Jr., Using DRAW, Graphics; Scott Norman, Field of Honor, Game; Paul Detwiler, Your Basic DBM, Home Management; Lynn Davis, Spiral Galaxy, Graphics;*

Dennis Kitsz, Custom Color, Hardware; Richard Ramella, Tick Talk, Education.

Pressing Enter returns you to the second menu. To exit the data-entry mode before the last record, type *Stop* in the first field of any record. You will then return to the main menu. Before trying the options save your file to tape. Otherwise if something goes wrong you might lose your data. Option 2 lets you scan the information in your file. Try it. At the *Last Record* message hit Enter to return to the menu. Option 3, *Delete Records* lets you delete one record at a time. At the *Sort Records* option (4), you have two choices: sort information by one field, or by multiple fields.

Choose option 1. Now choose the field to sort by. Press 3, for *Category*. Answer the next question by typing, *Graphics*. Here's where a RAM-based DBM shines. Records 4 and 7 instantly appear on your screen. Press Enter to return to the menu again.

Option 2 gives you the opportunity to make your search and sort criteria more narrow. In option 2 choose fields 2,3 and press Enter. For the *Which Logic* question choose 1, *And* (meaning fields 2 and 3 must equal the criteria you specify at the next prompt). Answer: *Congratulations . . . ; and Game*. Press Enter. The prompt tells you that all records have been sorted, but the screen is empty. The reason is that no records met your search criteria.

Try again. This time answer *Congratulations and General*. After you hit Enter, record 1 appears because it is the only record that meets all the criteria. Use Option 2 again, but this time specify *Or* as the logic. At the field prompts type *Congratulations*, then *Graphics*, and hit Enter. Now you are given three records, numbers 1, 4, and 7. Record 1 meets your criteria for field 2, *Congratulations*. Records 4 and 7 meet your criteria for field 3, *Graphics*. Try different combinations on your own until you completely understand the logic.

And that's all there is to it. The curious and pioneering Color Computerists will no doubt want to fancy this Basic DBM up a bit. Go ahead, and be sure to let us all know what you've concocted.

Program Listing 1

```

10 CLS: CLEAR10000
20 CFS="CREATE A FILE"
100 PRINTTAB(10)CFS
110 PRINT:PRINTTAB(10)"SELECT 1
OR 2"
120 PRINT:PRINTTAB(7)"1-CREATE A
NEW FILE"
130 PRINTTAB(7)"2-LOAD AN OLD FI
LE"
140 PRINT:INPUT"          YOUR SEL
ECTION";I
150 ONI GOTO500,9000
170 GOTO10
500 'SET-UP PARAMETERS
502 CLS
505 PRINTTAB(10)CFS:PRINT
510 INPUT"NAME OF FILE";NS
520 INPUT"NUMBER OF FIELDS 10 MA
X";N
530 INPUT"WHAT IS MAX# OF RECORD
S";M
540 DIM$(M,N)
550 FORZ=1TON
560 PRINT"WHAT IS NAME OF FIELD" Z
570 INPUT$(Z):NEXTZ
590 CLS:PRINT"THE FILE SET-UP FO
LLOWS":PRINT
600 PRINT"FILE NAME - "NS
610 FORX=1TON
620 PRINT"FIELD"X-"FS(X):NEXTX
625 PRINT"MAX# OF RECORDS-"M

```

Listing continued on page 30

Line By Line

- 100-170 First menu.
- 500-700 Sets up parameters.
- 1000-1120 Main menu.
- 3000-3999 Input data routine.
- 4000-4999 Scan routine.
- 5000-5999 Delete routine.
- 6000-6999 Sorting routine.
- 8000-8999 Saving files.
- 9000-9999 Loading routine. ■ ■ ■

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DISK DOUBLE ENTRY - If you have spent hours trying to balance your Debits and Credits, this program is for you! Designed for small business, club, and personal use. Enter transactions in a journal type format. Program will maintain current account balances, produce Trial Balance, Income, and Balance Sheet reports and complete Account Ledgers. Will handle up to 300 accounts including report headings and totals. Up to 1400 average transactions on a diskette. Summary reports and four levels of subtotals available. REQUIRES 32K and a user understanding of standard double entry accounting concepts. - \$44.95 in BASIC with Machine Language subroutines.

DISK DATA HANDLER - Will allow you to design disk data files for your specific applications. Provides a powerful facility for on-screen input and update, fast selection and sorting, user defined output of reports to screen or printer, and output to disk files which may be read by your BASIC programs for any computational or special formatting requirements. You define a basic record of up to 14 fields and 246 characters. Sort or select records based on any field or combination of fields in this record. Maximum number of records you may work with at one time will depend on record size (500 - 23 char records, 50 - 246 char records). An optional Extended record linked to the basic record may also be defined. The size of the Extended record is not a factor in determining maximum number of records. Disk Data Handler is the type of tool which will provide the growth capability needed for your increasingly sophisticated applications. REQUIRES 32K. - \$44.95 in BASIC with Machine Language subroutines.

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*JUNE '82

TAPE DATE-O-BASE CALENDAR - \$16.95
(max. 400 memos/tape file)

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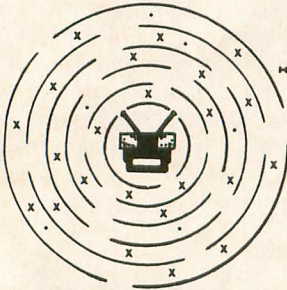
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Listing continued from page 28

```

630 PRINT:PRINT"IS THIS CORRECT
Y/N"
640 INPUT$
650 IFI$="N"THEN500
660 IFI$="Y"THENGOTO700ELSE590
700 Q=1
1000 'MENU
1010 CLS
1020 PRINTTAB(10)"SELECT 1-6"
1030 PRINT:PRINTTAB(8)"1-INPUT D
ATA"
1040 PRINTTAB(8)"2-SCAN ALL FILE
S"
1050 PRINTTAB(8)"3-DELETE RECORD
S"
1060 PRINTTAB(8)"4-SORT RECORDS"

1080 PRINTTAB(8)"6-SAVE FILES ON
TAPE"
1090 PRINT:INPUT"YOUR SE
LECTION";A
1100 IPA<OORA>6THEN1000
1110 ONA GOSUB3000,4000,5000,600
0,7000,8000
1120 GOTO1000
3000 'INPUT DATA
3002 CLS
3007 PRINT:PRINTTAB(10)"RECORD #
"Q"
3010 FORZ=1TON
3020 PRINT"WHAT IS "F$(Z)
3030 INPUT$(Q,Y)
3035 IF D$(Q,Y)="STOP"THEN3070
3040 NEXTZ
3050 Q=Q+1
3055 IF Q=M THEN1000
3060 GOTO3007
3070 D$(Q,Y)="":GOTO1000
4000 'SCAN ALL FILES
4002 CLS
4005 P=INT(16/(N+2))
4010 FORX=1TOQ-1STEP P
4020 FORZ=X TOX+(P-1)
4025 IF Z>Q THEN4085
4030 PRINT"RECORD #"Z
4035 FORW=1TON
4040 PRINT"FS(W)="-D$(Z,W)
4050 NEXTW
4060 NEXTZ
4065 PRINT"PRESS <XX> TO STOP SC
AN"
4070 INPUT"PRESS <ENTER> TO CONT
INUE";G$
4075 IF G$="XX"THEN1000
4080 NEXTX
4085 PRINT:PRINT"*****LAST RECO
RD*****"
4087 AS=INKEY$
4088 IF AS=" "THEN4087
4090 GOTO1000
5000 'DELETE RECORDS
5005 CLS:R=0
5010 PRINT:INPUT"TO DELETE A REC
ORD THE RECORD # MUST BE KNOWN.
IS THE RECORD # KNOWN? Y/N";G$
5025 IFG$="Y"THEN5050
5030 IFG$="N"THEN PRINT"PRESS <S
> TO SCAN RECORDS"ELSE5000
5035 INPUTK$
5040 IFK$="S"THEN GOSUB 4000
5049 PRINT"REDO"
5050 INPUT"WHAT IS THE RECORD #"
;R
5055 IFR>Q-1THEN5049
5060 IFR=0THEN1000
5070 FORX=R TOQ-2
5080 FORV=1TON
5090 D$(X,V)=D$(X+1,V)
5100 NEXTV
5110 NEXTX
5120 FORL=1TON
5130 D$(X,L)=" "
5140 NEXTL
5150 Q=Q-1
5160 GOTO1000
6000 'REM SORT RECORDS
6003 K=0
6005 GOSUB6500
6007 RETURN
6010 CLS:K=0
6020 PRINT"WHAT FIELD WILL YOU S
ORT ON":PRINT
6040 FORZ=1TON
6050 PRINTTAB(8)Z"-F$(Z)
6060 NEXTZ
6070 INPUTE
6080 IPE<OORE>N THEN6020
6090 INPUT"FIELD DATA TO SORT ON
";O$
6105 CLS
6110 FORZ=1TOQ
6140 IPOS=D$(Z,E)THENGOSUB6165
6150 NEXTZ
6160 PRINT"***ALL RECORDS SORTE
D***"
6161 INPUT"PRESS <ENTER> FOR MEN
U";L$
6162 RETURN
6165 '
6167 PRINT"RECORD #"Z
6168 K=K+1
6169 FORW=1TON
6170 PRINTF$(W)="-D$(Z,W)
6180 NEXTW
6185 P=INT(16/(N+2))
6190 IFK<P THEN RETURN
6200 INPUT"PRESS <ENTER> TO CONT
INUE";B$
6202 K=0
6205 RETURN
6500 'MENU FOR SORTS
6505 CLS
6510 PRINT:PRINTTAB(10)"SELECT 1
-4"
6520 PRINT:PRINTTAB(3)"1-STRING
MATCH ON 1 FIELD"
6530 PRINTTAB(3)"2-STRING MATCH
ON MULTIPLE"
6535 PRINTTAB(5)"FIELDS"
6560 INPUT"YOUR SELECTIO
N";M
6570 IFM<OORM>4THEN6500
6580 ON M GOSUB6010,6600
6590 RETURN
6600 'MULTIPLE STRING SORT
6610 CLS:K=0
6620 PRINT:PRINT"WHAT FIELDS WIL
L YOU SORT ON (2 MAX)"
6630 FORZ=1TON
6640 PRINTTAB(8)Z"-F$(Z)
6650 NEXTZ
6660 INPUT"FIELDS A,B";U,V
6670 PRINT:PRINTTAB(10)"WHICH LO
GIC"
6675 PRINT:PRINTTAB(14)"1-AND"
6677 PRINTTAB(14)"2-OR"
6679 PRINTTAB(14)"3-NOT"
6680 INPUTT
6682 PRINT"DATA FOR FIELD"U
6683 INPUTUS
6684 PRINT"DATA FOR FIELD"V
6685 INPUTVS
6690 IPT=1THEN6800
6700 IPT=2THEN6850
6710 IPT=3THEN6900ELSE6670
6800 CLS:FORZ=1TOQ-1
6810 IFU$=D$(Z,U)AND V$=D$(Z,V)T
HEN GOSUB6165
6815 NEXTZ
6820 GOTO6160
6850 CLS:FORZ=1TOQ-1
6860 IFU$=D$(Z,U)OR V$=D$(Z,V)T
HEN GOSUB6165
6870 NEXTZ
6880 GOTO6160
6900 CLS:FORZ=1TOQ-1
6910 IFU$=D$(Z,U)AND V$=D$(Z,V)T
HEN NEXTZ ELSE GOTO6920
6920 IFU$=D$(Z,U)OR V$=D$(Z,V)T
HENNEXTZ ELSE GOSUB6165
6940 GOTO6160
8000 'SAVE FILES ON TAPE
8010 CLS:PRINT@135,"SAVE FILES O
N TAPE"
8020 PRINT@234,"POSITION TAPE"
8030 PRINT@294,"PRESS PLAY & REC
ORD"
8040 PRINT@388,"PRESS <ENTER> WH
EN READY"
8050 INPUT$
8060 OPEN"O",#-1,NS
8065 PRINT#-1,N,M
8070 FORX=1TOQ-1
8075 FORZ=1TON
8080 PRINT#-1,F$(Z),D$(X,Z)
8085 NEXTZ
8090 NEXTX
8100 CLOSE #-1:RETURN
9000 'LOAD FILES FROM TAPE
9010 CLS
9015 INPUT"WHAT IS FILE NAME";N$
9018 CLS:PRINT@136,"LOAD FILES F
ROM TAPE"
9020 PRINT@235,"REWIND TAPE"
9030 PRINT@300,"PRESS PLAY"
9040 PRINT@388,"PRESS <ENTER> WH
EN READY"
9050 INPUTY$
9060 OPEN"i",#-1,NS
9065 INPUT#-1,N,M
9070 Q=1:DIMD$(M,N)
9080 IF EOF(-1)THEN9120
9085 FORZ=1TON
9090 INPUT#-1,F$(Z),D$(Q,Z)
9095 NEXTZ
9100 Q=Q+1
9110 GOTO9080
9120 CLOSE#-1:GOTO1000

```



illustration by Rod McCormick



Our Best Seller List For The TRS-80 Color Computer



101 Color Computer Programming Tips & Tricks



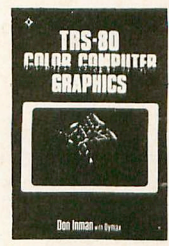
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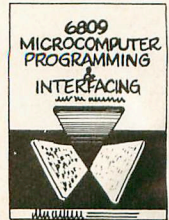
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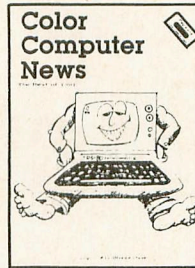
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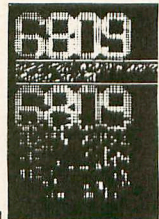
Ed. by Staugaard from Howard W. Sams
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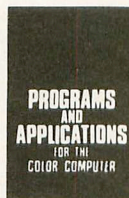
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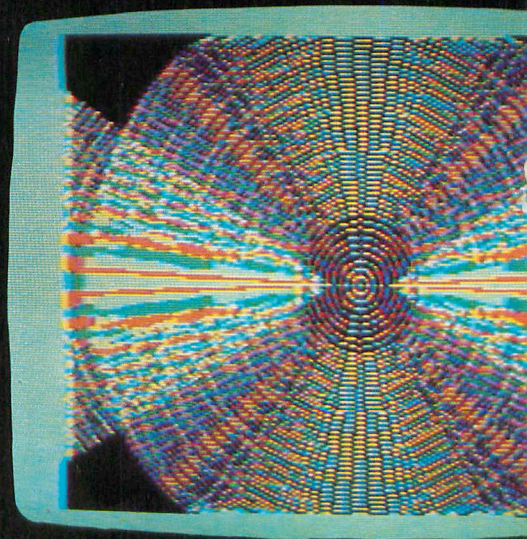
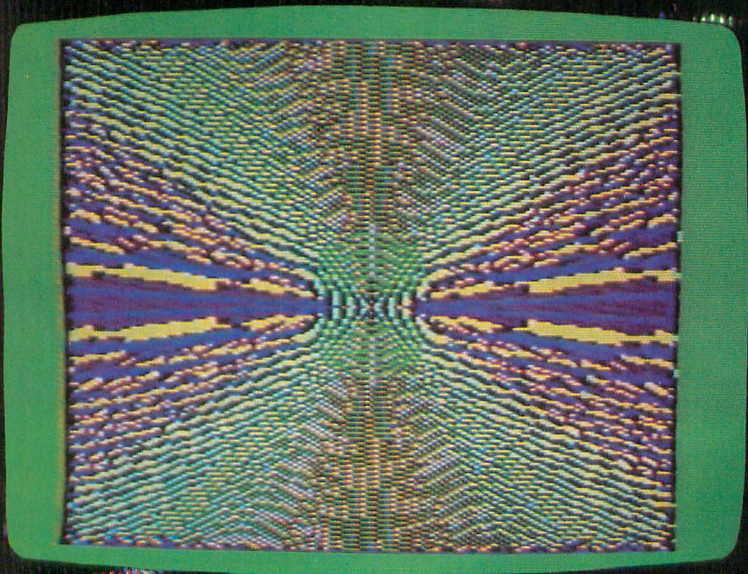
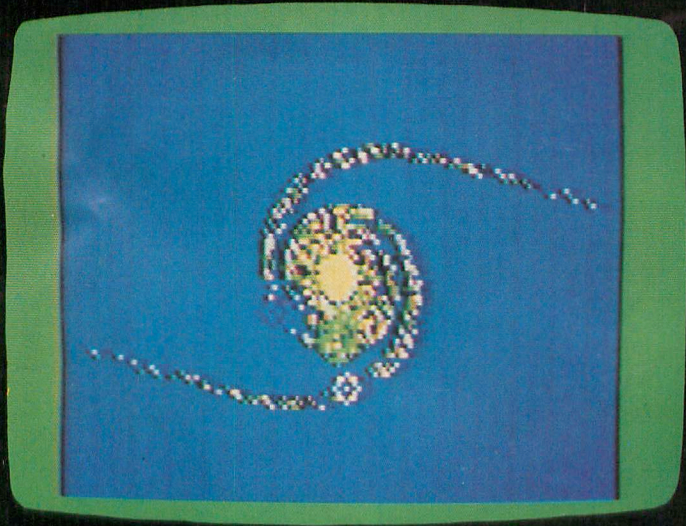
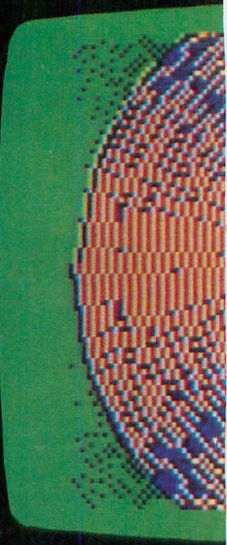
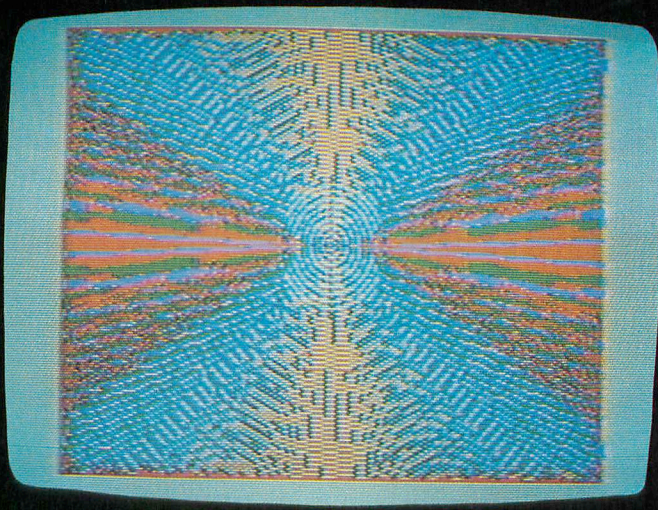
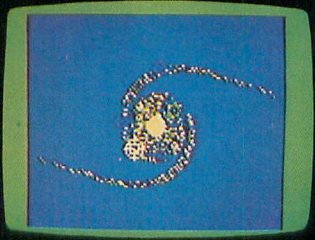
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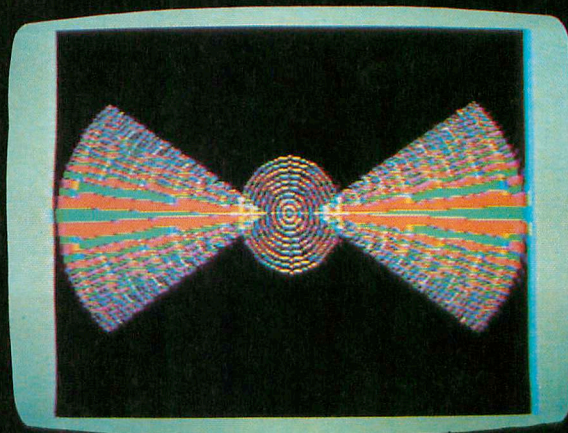
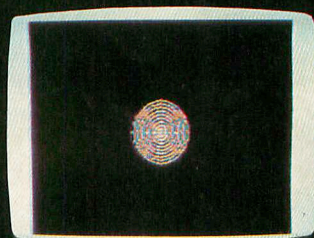
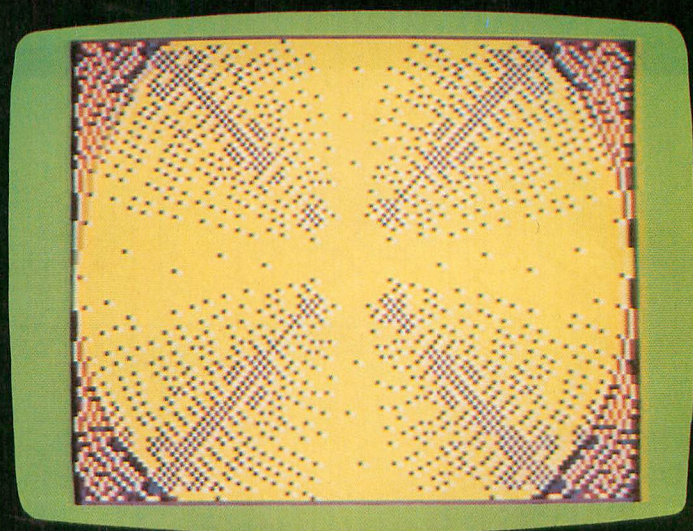
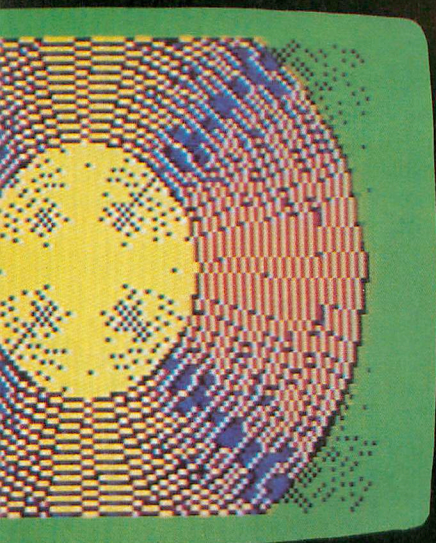
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by Lynn Davis
photographs by Ben Magro

HAVE YOU EVER run a program that drew curves or spirals and then listed the program to see how it worked? Were you then discouraged by a confusing array of sines, cosines, and other trigonometric functions?

If you can answer "yes" to the above, this article can relieve the confusion by teaching you to graph polar coordinates.

Please turn the page

Program Listing 1

```

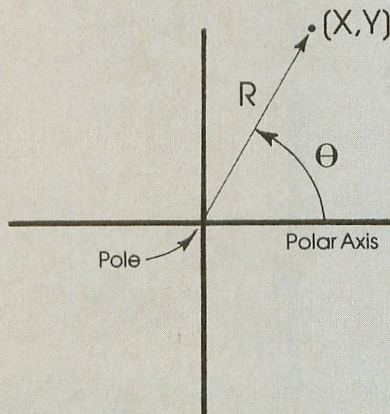
10 REM*****
20 REM      PROGRAM NUMBER 1
30 REM      POLAR GRAPHICS
40 REM      PROGRAM "R=" FORMULA
50 REM      INTO LINE NUMBER 130
60 REM
70 REM      TRS-80 COLOR COMPUTER
80 REM      EXTENDED BASIC
90 REM*****

100 PMODE4,1:PCLS:SCREEN1,1
110 FOR A=0 TO 360
120 TH=3.1415926*A/180
130 REM 'R='FORMULA ON THIS LINE

140 X=128+R*COS(TH)
150 X=INT(X+.5)
160 Y=96-R*SIN(TH)
170 Y=INT(Y+.5)
180 PSET (X,Y,1)
190 IF A<=360 THEN NEXT A
200 GOTO 200

```

Fig. 1



Continued from page 33

All you'll need is a Color Computer with Extended Color Basic, some time to read the explanations, and a little patience to type in the program. I'm sure you'll find polar graphics quite easy.

Polar One

The first program shows you all you need to make a polar graph. The program explains how to plot the graphs, and gives you a chance to try polar graphing without typing in a lot of lines.

Figure 1 shows the various polar terms used throughout the article.

Line 100 sets the computer in the highest graphics resolution; line 110 sets the range of angles (A) to be plotted. You can put any numbers into this FOR...NEXT loop, but 0-360 usually gives a completed graph.

Line 120 establishes the size of Theta (TH). Theta (Greek symbol Θ) is the angle

Program Listing 2

```

10 REM *****
20 REM      PROGRAM NUMBER 2
30 REM      POLAR GRAPHICS
40 REM
50 REM      23 POLAR FORMULAS
60 REM
70 REM
80 REM      TRS-80 COLOR COMPUTER
90 REM      EXTENDED BASIC
100 REM *****
110 REM
120 REM TITLE SCREEN
130 PMODE4,1:PCLS:SCREEN1,1
140 FOR S=1 TO 500:NEXT S
150 REM DRAW THE WORD 'POLAR'
160 DRAW "BM87,93;S8;U7R4F1D2G1N
L4BF1BD2 BR4 BR1H1U5E1R3F1D5G1NL
3BR1 BR4 NU7R5 BR4 U6E1R3F1D2NL5
D4 BR4 U7R4F1D1G1NL4F1D3"
170 FOR S=1 TO 1000:NEXT S
180 REM DRAW THE WORD 'GRAPHICS'
190 DRAW "BM62,115;S8;BU1U5E1R3F
1D1BD2NL2D2G1L3H1BF1BR4 BR4 U7R4
F1D1G1NL4F1D3 BR4 U6E1R3F1D2NL5D
4 BR4 U7R4F1D2G1NL4BF1BD2 BR4 U7
BD3R5NU3D4 BR4 BR1R2U7NL2R2BD7L2
BR1 BR4 BU1U5E1R3F1D1BD3D1G1L3H1
BF1BR4 BR4 BU1F1R3E1U2H1L3H1U1E1
R3F1BD6"
200 FOR S=1 TO 2000:NEXT S
210 Z=0
220 REM CONTROL OF THE TITLE AND
ENDING SCREEN
230 IF Z=0 THEN 390
240 IF Z=23 THEN 860
250 IF Z=1 THEN 260 ELSE 380
260 CLS
270 PRINT@9,"POLAR GRAPHICS"
280 PRINT:PRINT"TO DELAY THE PRO
GRAM FROM GOING"
290 PRINT"TO THE NEXT FORMULA, Y
OU CAN"
300 PRINT"INCREASE THE TIMER IN
LINE 580"
310 PRINT"OR PRESS THE <SHIFT> K
EY AND"
320 PRINT"THE <@> KEY AT THE SAM
E TIME."
330 PRINT:PRINT"TO MOVE FROM ONE
FORMULA TO THE"
340 PRINT"NEXT WITHOUT ALLOWING
THE"
350 PRINT"GRAPHICS TO BE COMPLET
ED, JUST"
360 PRINT"PRESS THE <N> KEY."
370 PRINT:INPUT"PRESS <ENTER> TO
CONTINUE";I$
380 PMODE4,1:PCLS:SCREEN1,1
390 A=0
400 REM COUNTER FOR TITLE AND EN
DING SCREEN AND FOR ORDER OF FOR
MULA USE
410 Z=Z+1
420 REM SIZE OF ANGLE TO BE GRAP
HED
430 FOR A=0 TO 360
440 REM CALCULATION OF THETA
450 TH=3.1415926*A/180
460 REM PRESS <N> KEY FOR NEXT F
ORMULA
470 A$=INKEY$:IF A$="N" THEN 230
480 REM FIND THE APPROPRIATE POL
AR FORMULA
490 ON Z GOSUB 610,620,630,640,6
50,660,670,680,690,700,710,720,7
30,740,750,760,770,780,790,800,8
10,820,840,860
500 REM CALCULATE THE X AND Y CO
ORDINATE AND ROUND OFF THE ANSWE
R
510 X=128+R*COS(TH)
520 X=INT(X+.5)
530 Y=96-R*SIN(TH)
540 Y=INT(Y+.5)
550 REM SET THE POINT ON THE SCR
EEN
560 PSET(X,Y,1)
570 IF A<=360 THEN NEXT A
580 IF A>360 THEN FOR S=1 TO 200
0:NEXT S:GOTO 230
590 REM POLAR FORMULAS
600 REM POLAR FORMULA FOR TITLE
SCREEN
610 R=22*(3+COS(20*COS(TH))):RET
URN
620 R=90*SIN(2*TH):RETURN:REM FO
UR-LEAVED ROSE
630 R=90*SIN(4*TH):RETURN:REM EI
GHT-LEAVED ROSE
640 R=90*SIN(10*TH):RETURN:REM T
WENTY LEAVED ROSE
650 R=10*(4+(1+SIN(TH))):RETURN:
REM CIRCLE
660 R=20*(3+COS(2*COS(TH))):RETU
RN:REM ELLIPSE
670 R=30*(2-COS(TH)):RETURN:REM
LIMACON
680 R=30*(1-2*SIN(TH)):RETURN
690 R=-90*(1/2*(SIN(TH)-1)):RETU
RN:REM CARDIOID
700 R=6*TH:RETURN:REM SPIRAL
710 R=SQR(3600/(TH+1)):RETURN:RE
M SPIRAL
720 R=20*(3+COS(2*TH)):RETURN
730 R=30*(2+SIN(3*TH)):RETURN
740 R=20*(3+COS(5*TH)):RETURN
750 R=3*(20+COS(5*TH)):RETURN
760 R=20*(3+COS(6*COS(TH))):RETU
RN
770 R=20*(3+COS(10*TH)):RETURN
780 R=30*(3*COS(4*COS(TH))):RETU
RN
790 R=30*(3*COS(6*COS(TH))):RETU
RN
800 R=20*(3+COS(93*TH)):RETURN
810 R=20*(3+COS(90*TH)):RETURN
820 R=30*(2+SIN(5459*TH)):RETURN
830 REM FORMULA FOR ENDING SCREE
N
840 R=30*(2+SIN(956*TH)):RETURN
850 REM DRAW THE WORD 'THE'
860 DRAW"BM104,95;S8;BR2U7NL2R2B
R1BD7 BR4 U7BD3R5NU3D4 BR4 U7NR5
BD3NR4BD4R5"
870 FOR S=1 TO 1000:NEXT S
880 REM DRAW THE WORD 'END'
890 DRAW"BM104,113;S8;U7NR5BD3NR
4BD4R5 BR4 U7BD1E1R3F1D6 BR4 U7R
4F1D5G1NL4BR1"
900 GOTO 900

```


calculated counterclockwise from the polar axis. The polar axis corresponds to the X-axis in the Cartesian System. Theta always equals Pi times angle A divided by 180.

Line 130 needs an R=Formula. The R formula calculates the distance from the pole to the point you are plotting (the pole being similar to the origin in the Cartesian System). One example of an R formula would be:

$$R = 30 * (2 - \cos(\text{TH}))$$

which produces what mathematicians call a limicon.

Lines 140 and 160 calculate the location of the X and Y points on the screen, with the numbers 128 and 96 placing the pole of the graph on the center of the screen. Lines 150 and 170 round off the calculated X and Y numbers and even out the graph; line 180 sets X and Y on the screen. Line 190 loops the program back if the angle is less than or equal to 360 degrees. If the angle is greater than 360 degrees, line 200 holds the completed graph for your viewing.

Polar Two

For this program all you need are some R formulas to construct different polar graphs.

Polar Two contains 23 different polar formulas that you can put, one at a time, into line 130 of Polar One. The R formulas are included in line 610–820 of Polar Two.

This program is for those of you who would like a polar graph demonstration program, or those who would rather not Break Polar One to type a different formula into line 130.

Lines 130–230 control the title screen. The words Polar Graphics are drawn on the screen and a polar graph is constructed around those words.

The variable Z in line 410 is a counter that controls the title screen, ending screen, and the R formula being used. Lines 260–370 are the directions.

Line 380 puts the computer into high resolution (hi-res) graphics. Line 430 establishes the angles (from 0–360 degrees); line 450 contains the formula for Theta.

Line 470 looks for the letter N to be typed, and if it is, the program jumps back to line 230 and into the next R formula.

Line 490 uses the counter Z to GOSUB to the appropriate R formula. Lines 510–580 are used in the same way as in Polar One, except that line 580 contains a delay to keep the completed graph on the screen for a few seconds.

Program Listing 3

```

10 REM*****
20 REM      PROGRAM NUMBER 3
30 REM      POLAR GRAPHICS
40 REM      ONE 'R' FORMULA WITH
50 REM      A VARIABLE CALLED 'Z'
60 REM
70 REM      TRS-80 COLOR COMPUTER
80 REM      EXTENDED BASIC
90 REM*****
100 CLS
110 PRINT:PRINT"REMEMBER YOU CAN
    PRESS THE <N>"
120 PRINT"KEY FOR THE NEXT INCRE
    MENT."
130 PRINT:PRINT"TYPE IN THE NUMB
    ER OF THE"
140 PRINT"VARIABLE YOU WISH 'Z'
    TO START"
150 PRINT"WITH."
160 PRINT:INPUT"<ENTER> VALUE FO
    R 'Z'";NU
170 Z=NU-1
180 PMODE4,1:PCLS:SCREEN1,1
190 Z=Z+1
200 FOR A=0 TO 360
210 TH=3.1415926*A/180
220 A$=INKEY$:IF A$="N" THEN 180
230 REM 'R'=FORMULA ON THIS LINE
    WITH A VARIABLE LABELED 'Z'
240 X=128+R*COS(TH)
250 Y=INT(X+.5)
260 Y=96-R*SIN(TH)
270 Y=INT(Y+.5)
280 PSET (X,Y,1)
290 IF A<=360 THEN NEXT A
300 IF A>360 THEN FOR T=1 TO 200
    :NEXT T:GOTO 180
500 REM SOME FORMULAS TO START W
    ITH
510 REM R=20*(3+COS(Z*COS(TH)))
520 REM R=90*SIN(Z*TH)
530 REM R=20*(3+COS(Z*TH))
540 REM R=3*(20+COS(Z*TH))
550 REM R=30*(3*COS(Z*COS(TH)))

```

Lines 850–890 draws THE END in the middle of the last polar graph to show you the program has run to completion.

Multiplication Factor

The R formulas are the heart of polar graphics. You can find them in any math book that deals with graphing polar coordinates. The only thing you may need to add is a multiplication factor to make the graph large enough to fit your needs.

An R formula from a textbook may look like this:

$$R = 3 + \cos(2 * \text{TH})$$

If you construct this figure on the computer screen, it will probably be too small to be easily seen. To make the display larger, add a multiplication factor to the beginning of the formula, like this:

$$R = 20 * (3 + \cos(2 * \text{TH}))$$

Polar Three

Polar Three lets you experiment with a few formulas to construct some spectacular polar graphs.

While working with polar formulas, I found some of them contain numbers that, if changed from one graph to the next, produce a variety of graphs.

I labeled the variable in the R formula with the letter Z. One of the formulas this works in is:

$$R = 20 * (3 + \cos(Z * \cos(\text{TH})))$$

Polar Three lets you type in an R formula with a variable Z and will then construct many different polar graphs, one after another, until you're tired of them.

Lines 100–150 are the directions; line 160 lets you choose the size of the vari-

able Z you want to start with. I have tried negative numbers and numbers as large as one million — so I guess you can start anywhere. I suggest starting with one and after that just experimenting.

Line 180 puts the computer into hi-res; line 190 increments the variable Z by a factor of one everytime a new graph starts.

The rest of the program is the same as Polar One. Remember to type the R formula with a Z variable into line 230. Lines 510–550 give you five R formulas that you can start with.

Some of the graphs will be quite spectacular, most will look nice, and the rest will look like garbage. If you follow a sequence of graphs long enough, you'll find that the garbage graphs are usually caused by not giving the computer enough angles to plot points with. You can change line 200 to read: 200 FOR A=0 TO 360 STEP .1. This gives the computer 10 times more points to plot, but it will take the computer 10 times longer to draw one graph.

Also included in this program (in line 220) is the INKEY\$ N, provided so you can skip to the next formula if you don't like the present one.

Polar Four — A Spiral Galaxy

The last program is a tutorial that uses what you have learned regarding polar graphics. The heart of the program is the R formula

$$R = \text{SQR}(3600/\text{TH})$$

which produces a spiral. By putting two

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Continued from page 35

of these R formulas together, the computer constructs what looks like a two-armed spiral galaxy.

Lines 120-240 are the title screen. One hundred random points (stars) are set on the screen, after which expanding and contracting circles reveal the title, Spiral Galaxy.

Lines 260-370 contain the instructions, and line 390 sets the graphics mode. The computer uses PMODE1,1 to set larger graphics blocks, and also to use the colors blue, green, yellow, and red. The PCLS(3) in line 390 clears the screen to the color blue.

Lines 420-600 produce the two-armed spiral galaxy; most of the pro-

gramming in those lines are taken from techniques used in Polar One.

To produce a two-armed spiral, the program must construct two separate spirals. The first time the program runs through this section (labeled T in line 430) the angles will go from 15-1500; the second time (line 440), the angles will

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Program Listing 4

```
10 REM *****
20 REM      A SPIRAL GALAXY
30 REM
40 REM      BY: MR. LYNN DAVIS
50 REM      4316 AMBLEWOOD LANE
60 REM      CLAY, NEW YORK 13041
70 REM
80 REM      TRS-80 COLOR COMPUTER
90 REM      EXTENDED BASIC
100 REM *****
110 REM TITLE SCREEN
120 PMODE 4,1:PCLS:SCREEN1,1
130 FOR X=1 TO 100
140 S1=RND(256):S2=RND(192)
150 PSET(S1,S2,1):NEXT X
160 FOR Z=1 TO 55:CIRCLE(128,96)
,Z,1,.75:NEXT Z
170 FOR Z=55 TO 1 STEP-1
180 REM DRAW THE WORD 'SPIRAL'
190 DRAW"S8;BM81,90;BU1F1R3E1U2H
1L3H1U1E1R3F1BD6 BR4 U7R4F1D2G1N
L4BF1BD2 BR4 BR1R2U7NL2R2BD7L2BR
1 BR4 U7R4F1D1G1NL4F1D3 BR4 U6E1
R3F1D2NL5D4 BR4 NU7R5"
200 REM DRAW THE WORD 'GALAXY'
210 DRAW"S8;BM80,110;BU1U5E1R3F1
D1BD2NL2D2G1L3H1BF1BR4 BR4 U6E1R
3F1D2NL5D4 BR4 NU7R5 BR4 U6E1R3F
1D2NL5D4 BR4 U1E5U1BL5D1F5D1 BR4
BU5NU2F2ND3E2U2BD7"
220 CIRCLE(128,96),Z,0,.75:NEXT
Z
230 FOR TT=1 TO 2000:NEXT TT
240 PCLS:FOR TT=1 TO 400:NEXT TT
:CLS
250 REM INTRODUCTION
260 PRINT" THIS PROGRAM PRODUCES
A SPIRAL"
270 PRINT"GALAXY. ONCE THE GALAX
Y IS"
280 PRINT"COMPLETED (AROUND 4 MI
NUTES),"
290 PRINT"YOU CAN SIMULATE SUPER
NOVAS BY"
300 PRINT"PRESSING THE <S> KEY.
YOU MAY"
310 PRINT"ALSO SEE A RESULTING N
EBULA."
320 PRINT:PRINT" THE NEBULAS ARE
THE COLOR OF"
330 PRINT"THE EXPLODING STARS."
340 PRINT:PRINT" WHEN DONE MAKIN
G SUPERNOVAS"
350 PRINT"PRESS <B>, THE 'BIG BA
NG' KEY,"
360 PRINT"TO START OVER."
370 PRINT:INPUT"PRESS <ENTER> TO
START";EN$
380 REM CONSTRUCT THE SPIRAL GAL
AXY
390 PMODE 1,1:PCLS3:SCREEN1,0
400 REM POLAR GRAPHICS ARE USED
TO CREATE TWO SPIRALS THAT CONNE
CT
410 REM THE TWO SPIRALS PRODUCE
A TWO-ARMED SPIRAL GALAXY
420 FOR T=1 TO 2
430 IF T=1 THEN FOR A=15 TO 1500
STEP 3
440 IF T=2 THEN FOR A=15 TO 450
STEP 3
450 TH=3.1415926*A/180
460 REM 'R' FORMULA
470 R=SQR(3600/TH)
480 X=126+R*COS(TH)
490 IF T=2 THEN X=126-R*COS(TH)
500 X=INT(X+.5)
510 Y=96-R*SIN(TH)
520 IF T=2 THEN Y=96+R*SIN(TH)
530 Y=INT(Y+.5)
540 REM SET THREE POINTS TO GIVE
A THICKNESS TO THE GALAXY
550 FOR Z= 0 TO 4 STEP 2
560 CL=RND(4)
570 IF CL=3 THEN 560
580 PSET(X+Z,Y+Z,CL)
590 NEXT Z
600 NEXT A
610 REM CREATE THE CENTER OF THE
GALAXY
620 CIRCLE(126,96),10,2
630 PAINT (126,96),2,2
640 NEXT T
650 PLAY"O3;V30;1;5;8;O4;1"
660 REM SPIRAL GALAXY COMPLETED-
CHECK FOR INPUT OF <S> OR <B>
670 BB$=INKEY$:IF BB$="S" THEN G
OTO 730
680 IF BB$="B" THEN GOTO 1040
690 GOTO 670
700 REM CREATE THE SUPERNOVA
710 REM RANDOMLY SELECT IN WHICH
PART OF THE GALAXY THE SUPERNOV
A WILL OCCUR
720 REM ODDS ARE APPROXIMATELY 4
TO 1 FOR IT TO OCCUR IN THE FIR
ST SPIRAL
730 C=RND(4)
740 U=0
750 IF C=1 THEN 830 ELSE 790
760 REM MOST OF THE 'STARS' ARE
TOWARDS THE CENTER OF THE GALAXY
770 REM ONLY USE OUTERMOST 'STAR
S' TO EXPLODE
780 REM IF FIRST SPIRAL, DETERMI
NE ANGLE
790 AA=RND(500)+15
800 U=1
810 GOTO 860
820 REM IF SECOND SPIRAL, DETERM
INE ANGLE
830 AA=RND(110)+15
840 U=2
850 REM ONCE ANGLE IS CHOSEN, CA
LCULATE WHERE THE EXPLODING STAR
WILL APPEAR
860 T1=3.1515926*AA/180
870 R1=SQR(3600/T1)
880 IF U=1 THEN XX=126+R1*COS(T1
) ELSE XX=126-R1*COS(T1)
890 XX=INT(XX+.5)
900 IF U=1 THEN YY=96-R1*SIN(T1)
ELSE YY=96+R1*SIN(T1)
910 YY=INT(YY+.5)
920 REM FIND THE COLOR OF THE ST
AR THAT EXPLODES
930 CO=PPOINT(XX,YY)
940 REM IF THE COLOR OF THAT POI
NT IS BLUE THERE IS NO STAR AT T
HAT POINT
950 REM IF THE COLOR OF THE POIN
T IS BLUE THEN NO SUPERNOVA
960 IF CO=3 THEN 670
970 REM THE ACTUAL SUPERNOVA
980 FOR H=1 TO 15 STEP 5:CIRCLE(
XX,YY),H,CO:NEXT H
990 SOUND 50,5
1000 FOR H=1 TO 100:NEXT H
1010 FOR H=15 TO 1 STEP -5:CIRCL
E(XX,YY),H,3:NEXT H
1020 GOTO 670
1030 REM THE BIG BANG
1040 SCREEN1,1
1050 FOR T=1 TO 400:NEXT T
1060 PCLS3:SCREEN1,0
1070 FOR SN=170 TO 0 STEP-2:CIRC
LE(128,96),SN,2:NEXT SN
1080 FOR SN=169 TO 50 STEP-4:CIR
CLE(128,96),SN,4:NEXT SN
1090 FOR SN=168 TO 50 STEP-2:CIR
CLE(128,96),SN,1:NEXT SN
1100 FOR SN=167 TO 0 STEP-2:CIRC
LE(128,96),SN,3:NEXT SN
1110 PMODE 4,1:PCLS:SCREEN1,1
1120 FOR C1=1 TO 28 STEP 3:CIRCL
E(128,96),C1,1:NEXT C1
1130 FOR C2=1 TO 150 STEP 2:CIRC
LE(114,96),C2,1,.8,.4,.62:CIRCL
E(142,96),C2,1,.8,.9,.12:NEXT C2
1140 FOR C3=28 TO 170 STEP 2:CIR
CLE(128,96),C3,1:NEXT C3
1150 FOR T=1 TO 60 STEP 2
1160 PMODE3,1:SCREEN1,0
1170 SOUND150+T,1
1180 FOR X=1 TO 30:NEXT X
1190 PMODE3,1:SCREEN1,1
1200 SOUND150+T,1
1210 FOR X=1 TO 30:NEXT X
1220 NEXT T
1230 SOUND212,40
1240 GOTO 120
```

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This is a two-program package. Checkbook is used to maintain your checking account and Checkfinder maintains a file of all your cancelled checks. Thirty-three different budgets can be set up to assign each check to. The budget names are DATA statements and may be easily changed by the user to fit his individual needs.

Checkbook includes a test data generator which may be used to make test runs on the program without the need to use real checks. The menu format makes it easy to change functions, and the program is human engineered to require the least number of keyboard actions. The program will justify your account against the bank's monthly statements. There's even a bill estimator to help you decide who gets paid this month.

Checkfinder gets the cancelled checks from a data tape generated by the Checkbook program, and builds a cancelled check file. It will locate cancelled checks for you and total the amount of all checks found.

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Now, a high level, scientific programming language that doesn't cost \$200 or

\$300 for the home computer. This language is perfect for the mathematician, scientist, engineer, or anyone who just wants to learn a new language. The power of this multiplication or other matrix problem solving that would require hours of programming time in BASIC are solved quickly and with minimal effort in APL.

Minimum system requirements: 32K disk system (48K recommended).

9 GAMES FOR PRE-SCHOOLERS

Until they go to school, children think that learning is fun, not work. Is this the reason that they learn so much faster in the early years? And learning is great play. With these games, children teach each other the alphabet, addition and subtraction, recognition of letters and words, even art as they play with patterns on the screen. The games are written for ages four to six. All nine games and the menu are in the computer at one time, and the children will quickly learn to select the one they want.

TINY COMP

A BASIC compiler in BASIC! Run your source program in Basic, compile it into FAST Z-80 code and execute the compiled version—all without reloading. 26 integer variables, GOTO, GOSUB, END, REM, RND, LET, \$, *, /, IF, THEN, ..., INKEY\$, CLS, PRINT\$, CHR\$, PEEK, POKE, Compiled programs can be saved via TAPEDISK.

TINY COMP comes with the game program, 3D TIC TAC TOE, which uses all of the TINY COMP statement sets and is ready to compile.

Manual includes several programs as well as thorough documentation of the compiler for those who like to know how things work.

INVENTORY 'S' WITH INVOICING

Inventory 'S' is an exciting advance in small business software for the S-80. Its in-memory system for data storage solves the problems of both sequential and random access files while providing extremely fast, random access to any record. Other advantages include the ability to use any combination of characters for stock numbers, an exceptionally flexible record format (field names are user-definable), and the ability to store data to tape or disk and upgrade at any time. An important feature is the ability to use your present stock numbers (a sort function is included), unlike competing systems that force you to use a different record number.

PASCAL-80

Phelps Gates, the author of APL-80, brings you PASCAL-80 for your TRS-80. Now you can add another dimension to your programming skills by using this fast version of the compiled language Pascal.

PASCAL-80 is a powerful structured, and well-defined language for the TRS-80 microcomputer. This easy to use language makes writing well structured, and therefore easily understandable. PASCAL-80 supports most of the features of UCSD Pascal, including RECORD, SET, (to 256 members), FILE (Text and record oriented), n-dimensional ARRAY (and ARRAY of ARRAY, etc.) global GOTO ELSE in CASE statements, and BCD arithmetic accurate to a full 14 places (including log and trig functions), six digit optional. PASCAL-80 features a 23600 byte workspace in 48K, a

1000 line per minute compiler, an easy to use text editor, and plain english error message, all the features you would expect in a Pascal costing hundreds more.

PASCAL-80 does not implement variant records, pointer and window variables, or functions, and procedures used as parameters.

FLOPPY DISK DIAGNOSTIC

Includes these features: 35 or 40 tracks in the same program; tests controller functions and status bits; test drive speed and allows adjustment; test switches and mechanical components; verifies data transfer; test drive seek function; sector and byte write and read test using all possible patterns; tests cross-cylinder interference; test drive-to-drive compatibility.

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RAMPARTS

Color Computer/37

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go from 15–450. Both increment in steps of three.

Construction of the first spiral starts on the right side of the screen, spiraling counterclockwise into the center. Once completed, construction of the second spiral starts on the left side of the screen, also spiraling counterclockwise. Lines 480–490 and 510–520 achieve this effect. Changing the signs for the X and Y points in the second spiral produces an upside-down image.

Lines 550–590 do two things. Lines 550 and 580 set three X, Y points (or three stars) on the screen to give the galaxy a look of depth. In line 560, the points, or stars in the galaxy, are given a random color; if that random color is blue (color 3), the computer selects another color (lines 560 and 570). You can't use blue for stars because that's the background color.

After completing the first spiral, lines 620 and 630 PAINT the center of the galaxy yellow. When both spirals are complete, line 650 plays four musical notes to signal the galaxy's completion.

Supernova or Big Bang?

Lines 670–690 allow the INKEY\$ of a letter S or B. If you press S (supernova),

the computer will GOTO line 730 and produce a star that totally explodes, leaving behind a nebula.

Lines 730–1120 produce the supernova. Line 730 picks a random number between one and four; if the random number is one, the supernova appears in the spiral with the fewer number of stars. If the random number is not one, the supernova appears in the spiral with the greater number of stars. This is done because there are more stars in the right spiral and supernovae have a larger chance of occurring there.

Once you select the spiral, the computer will GOTO line 830 to find the angle of the exploding star in the small spiral, or GOTO line 790 to find the angle in the larger spiral.

Line 790 or line 830 (depending on the spiral you're working with) picks a random angle for the supernovae to occur. The numbers for the angles are smaller than those used in the spiral's construction, because most of the points are plotted toward the center of the galaxy. Without limiting the supernovae to the outermost sections, most of the explosions would occur in the middle of the screen.

Line 800 or line 840 sets a flag, depending on the spiral selected. Lines 860–910 use the other polar formulas to

determine the location of the exploding X, Y coordinate.

To summarize lines 730–910: The spiral containing the supernova is randomly chosen and calculates the location of the exploding star.

Line 930 determines the color of the star at the X, Y coordinate. If the color of that point is blue, line 960 sends the program back to INKEY\$. Line 570 ensures that no blue stars were plotted on the blue background.

If the color of that point is not blue, then the program proceeds from line 980 through line 1020. Expanding and contracting circles of different sizes produces the supernova. The color of the circles are the same color as the star. The different sized circles, after contracting, leave behind a small circle, reminiscent of a nebula.

Supernovae can be produced indefinitely; sometimes pressing S will not result in a supernova. This happens only if the color of the randomly selected point is blue. Keep pressing S and eventually a supernova will occur.

When you have finished blowing up the spiral galaxy star by star, press B for Big Bang. This not only destroys every star in the galaxy, but the entire universe as well (or at least the entire universe as the computer knows it).

Lines 1040–1230 produce the Big Bang; line 1040 shifts to the other SCREEN configuration for PMODE1,1, which changes the colors from green, yellow, blue, and red to buff, cyan, magenta, and orange.

Line 1060 then clears the screen to blue, and lines 1070–1100 draw shrinking circles of various colors. Line 1110 jumps the graphics into the highest resolution, clears the screen and draws circles and arcs expanding outward from the center of the screen.

Lines 1150–1220 change the graphics on the screen to PMODE3,1 and shifts the colors between SCREEN 1,0 and SCREEN 1,1. This produces a dazzling explosion complete with sound effects.

The Key

The key to this program is in the manipulation of the polar graphics formulas. They are needed for construction of the spirals and to locate the points on the spiral that explode.

The best point about all this, is in the self-satisfaction of looking at a program that uses polar graphics and saying to yourself "I know how to do that—it's easy."

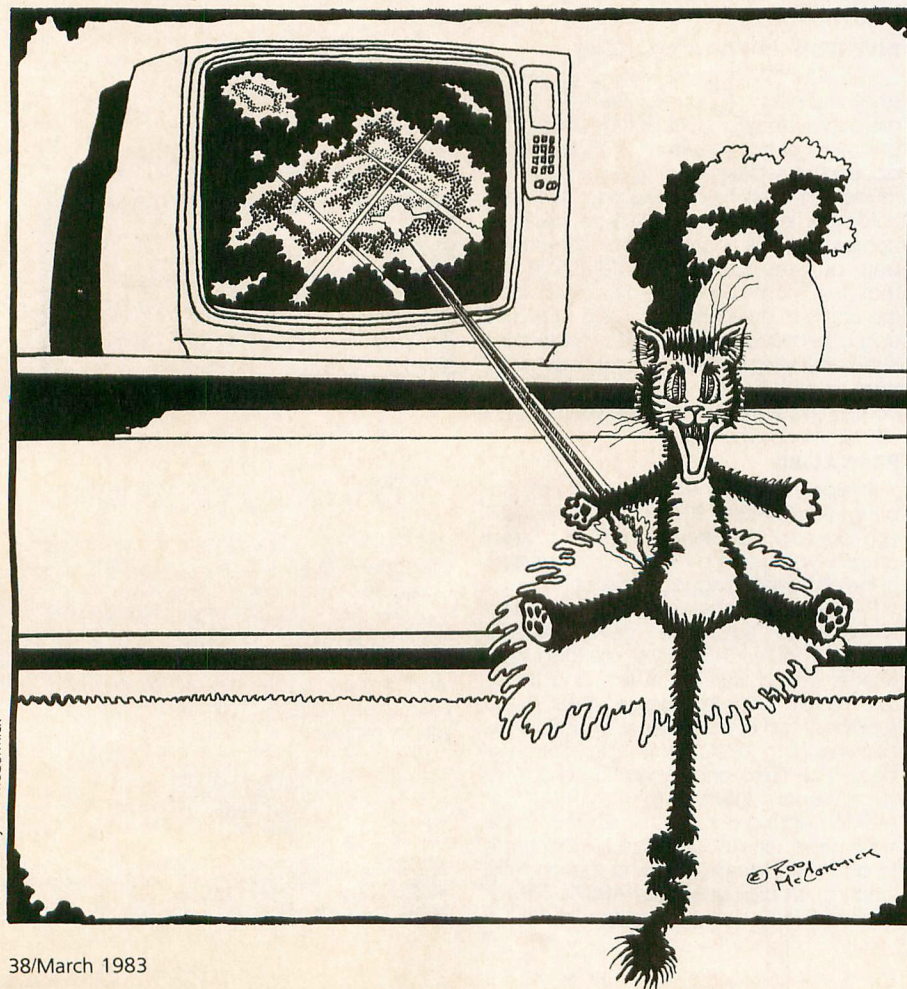


Illustration by Rod McCormick



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Custom Color

by Dennis Kitz



illustration by Rod McCormick

AN ICE STORM rages outside while a solar storm creates beautiful auroras in the sky above, Northern lights which aren't visible. For me, the only way to lift this storm-inspired depression is to upgrade several Color Computers for friends — more memory, better Basic, clearer video.

For less than a hundred dollars, plus some time, you can expand your Color Computer from the \$299 special — 16K Color Basic — to a 32K Extended Color Basic machine with direct video output. In the process, you will discover how the inside of the machine is organized and learn a great deal about how it works. First glance through the photos accompanying this article to get an idea of what your computer looks like and what will be involved. Then, before getting started, make a trip to Radio Shack and purchase their excellent *Color Computer Technical Reference Manual*, Cat. No. 26-3193, \$14.95.

This first edition of Custom Color is down-n-dirty practical, and I'll save the theory for later. For now, we'll just get your machine in shape.

I recommend a static-free workbench with a solid metal surface, for this project and some pads of conductive foam (Radio Shack Cat. No. 276-2400), or a static-free workbench pad (#WS-9010, \$15 plus shipping from Wescorp, 1155 Terra Bella Ave., Mountain View, CA 94043).

Opening the Computer

This will be the single hardest step for the first-timer to take. If you do not have Extended Basic, turn the machine on and mark down the Color Basic sign-on message revision number (1.0 or 1.1 at this writing). Now unplug the computer, and turn the machine over on a soft towel to avoid scratching the silver-grey paint. Removing the first six screws takes only a Phillips-type screwdriver (see Photo 1), but the final screw is located underneath a label with the warning message: "Opening case will void warranty. See owner's manual for warranty information."

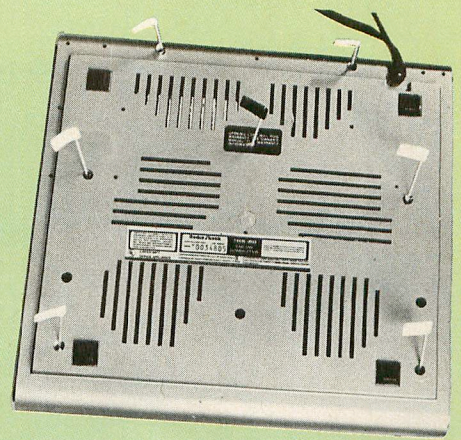
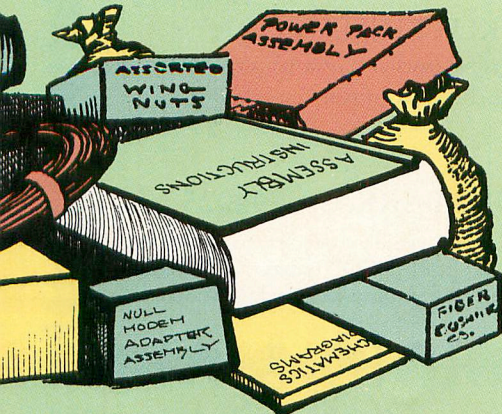


Photo 1. Here's where to find the Color Computer's screws. The white flags identify the six holes where Phillips-type screws are located. The seventh screw, black flag, is located under the warranty label.



Photo 2. Lift the case top up and backward from the front; it has a plastic lip to hold it down and will snap up when enough pressure is applied.

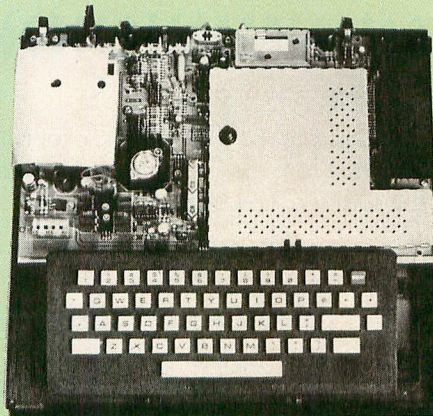


Photo 3. Inside the computer, left to right: transformer and AC power supply under an insulating shield; +5, -5 and +12 regulated power supplies (including heat sinks); cassette and joystick circuitry (at back); RF modulator (metal box at back); interference shield (large metal cover); and cartridge slot.

made. This will come in handy if you ever have to return the computer to Radio Shack for repairs.

You can now confidently punch through the warning label and remove the seventh screw. Hold the case together tightly and flip it upright. Slide your fingernails under the front lip, and lift the top up and back (Photo 2). The inside is shown in Photo 3.

Before continuing, identify your "board revision" (Photo 4). Most stan-

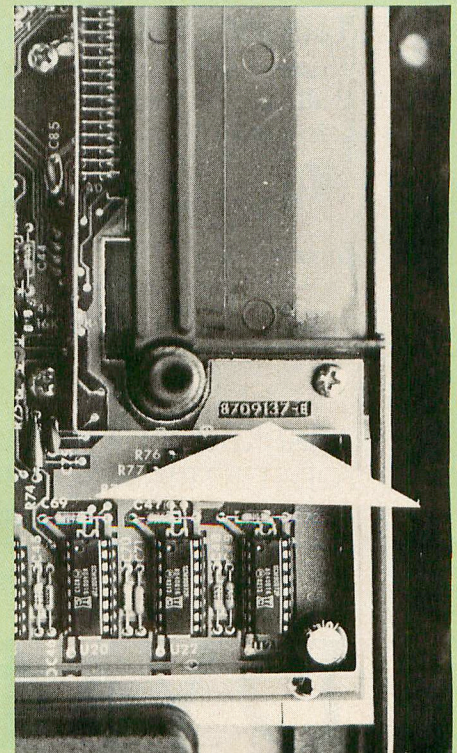


Photo 4. Your board revision is identified by a number just below the cartridge slot (white arrow points to identification number). This is revision E, the first board in which 64K RAMs could be used easily.

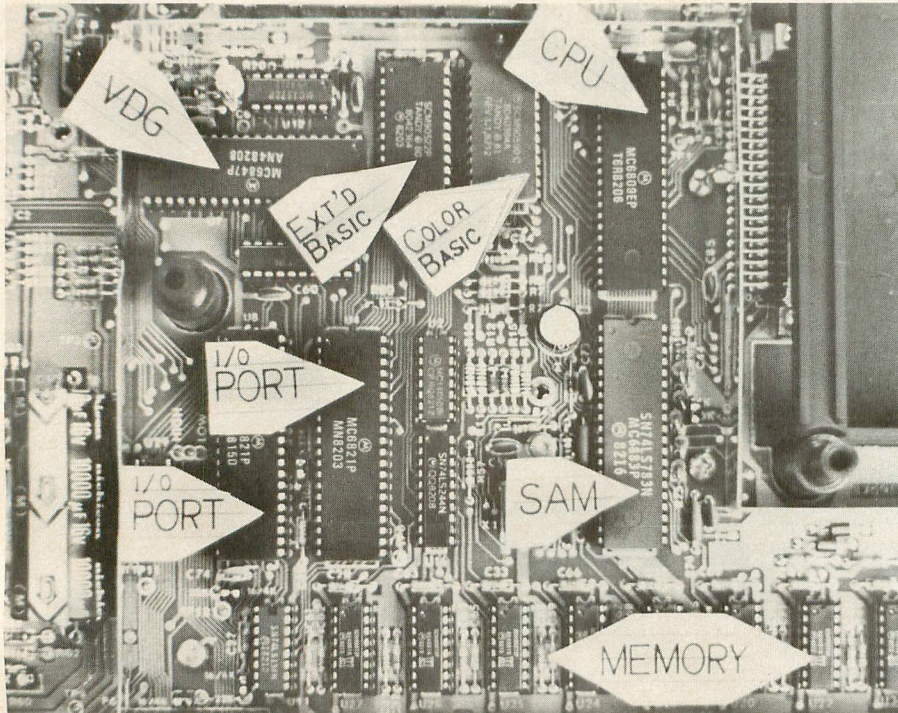


Photo 5. Layout underneath the metal shield, made up entirely of Motorola integrated circuits: VDG is the type 6847 video display generator; CPU is a 6809E; Basic ICs are both 68A364 industrial ROMs; I/O ports are 6821; memory consists of eight standard 4027 (4K), 4116 (16K), or 4164 (64K) dynamic RAMs; SAM is the synchronous address multiplexer, Motorola type 6883 (or generic type 74LS783).

Continued from page 41

standard Color Computers are D and E revisions, though I have seen a few C boards. The new white-case TDP computers have

an F revision with a smaller metal shield covering the guts. Mark down the revision code. Identify the two white plastic straps holding down the large metal

shield; clip them with snips and pull them out with pliers. Lift the metal shield straight up, slowly sliding the sides upward until the dozens of metal fingers slip off the frame below. The heart of the computer is under this shield, as you can see in Photo 5.

4K to 16K

To make any reasonable computer upgrades, you will need at least 16K of memory. At this point, you have several options: 1) obtain eight 4116, 250 nS dynamic memories (under \$10 these days) for a straightforward 16K upgrade; 2) obtain sixteen 4116 dynamic memories for a piggyback-type 32K memory upgrade; 3) obtain eight 4164 dynamic memories (about \$48 a set) for an immediate 32K upgrade and future 64K upgrade. Both 32K upgrades will be covered later in this article; for now, you'll probably want at least the 16K. Leave the memories you have purchased in their packaging.

Under the metal shield, toward the keyboard, are eight identical integrated circuits: U27, U26, U25, U24, U23, U20, U22, and U21. These are the memories. Notice that each contains a rounded notch in one end pointing toward the back of the machine. Now refer to Photo

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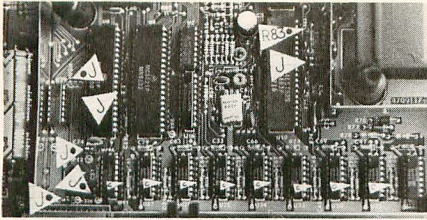


Photo 6. Upgrading from 4K to 16K, and 16K to 32K, the Radio Shack way. Only two jumpers are changed to upgrade to 16K; an additional four must be moved, and a resistor added, for the official 32K upgrade. The C labels indicate the integrated circuits. See text before performing any upgrades!

6; the J's are jumpers. You will need to locate the two J's not marked with black dots in the photo. Move both jumpers from the 4K pair of upright posts to the 16K (or 16K/32K) position. The center post is common to both.

Remove the 4K memories by sliding a small screwdriver, dentist tool, or other small implement between each memory chip and its socket. Rock slowly from each end, alternately until the memories come loose; don't rush. Wrap them in aluminum foil and give them to your favorite hacker, or send them to a school, college, or prison electronics shop (used prices for these are 10 cents or less each, so don't expect to make any money by selling them).

Cut a square of aluminum foil or black static-free foam, and set it down on your work area. Open the package of 16K dynamic memories and slide them, pins down, onto the foil or foam. Each chip

has a notch on one end. When in place, this notch should point to the back of the computer, just as the 4K memories did. Using an IC inserter (Radio Shack Cat. No. 276-1574, \$6.95), press each memory into place. If you don't use an inserter, you must squeeze the pins of each memory chip together slightly when pushing them into the sockets. Handle the ICs with a small piece of foil around all the pins when inserting by hand.

When all eight chips are in place, check that no tool or debris is left in the computer, and temporarily set the grey cover back in place. Hook up the machine, restore power, and type: PRINT MEM. A Color Basic machine will read 14631. If the machine reads 2343, you have probably not moved the jumpers. If the machine reads greater than 2343 but less than 14631, you probably have installed at least one defective memory chip. If the machine hangs up, or crashes quickly, you have probably bent a pin underneath or outside of the socket.

If all is well, you're ready to continue with the upgrades. Disconnect the power and remove the cover again.

Basic Upgrades

Upgrading to Extended Color Basic is physically an easy task. You must first ob-

tain the Extended Color Basic Kit (Catalog #26-3018, \$99) or the Extended Color Basic ROM alone (Catalog #AXX-3054, \$64.16, from Radio Shack National Parts). Please do not hassle your local Radio Shack store for the AXX-3054 part; they can't get it. Only Computer Centers can obtain the ROM alone. If you feel capable of following installation instructions, go to your nearest computer center and order ROMs for all the Color Computers in your family. If you must upgrade three machines to Extended Color Basic, the savings are over \$100. But remember, you will not receive any documentation, help, or the Extended Color Basic manual (Cat. No. 26-3192, \$5.95). Only the ROM. *Once you receive your Extended Color Basic ROM, do not open the package until you have read the following instructions.*

Using Photo 5, identify the position of the Extended Color Basic ROM (U28). Presently, it will be an empty socket toward the back of the shielded area. At this point, mark down all the information found on top of the Color Basic ROM (U3) already in the machine; a "Rev 1.1" will be helpful later.

Cut a square of aluminum foil or black static-free foam, and set it down on your
Please turn the page

ugar
Software



Auto Run is a utility program for the TRS-80* Extended Basic Color Computer. It is used to add convenience and professionalism to your software. Auto Run will help you create your title screen with the graphics editor. The graphics editor allows you to choose a background color and border style. Using the arrow keys and several other commands you can draw pictures, block letters and also include text.

Auto Run will generate a machine language loader program to precede your program on the tape. Then, to start up your program, simply type CLOADM to load in the Auto Run loader program, which will then automatically start itself up, display your title screen, load your program and then RUN or EXEC it.

Also you may record a vocal or musical introduction preceding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above \$600 (the PCLEAR 0 page).

Software authors: The Auto Run may be appended to your software products.

Auto Run is \$14.95 and includes complete documentation and an assembly source listing. Requires 16K Extended Basic.

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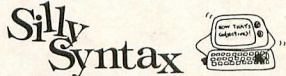
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1982 TMS Bibliography — \$9.95



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For 1 to 10 players. Load a story into the computer. The players are asked to supply a noun, verb, part of body, celebrity, etc. which the program uses to complete the story. The story, which is displayed when all words are entered, will be hilarious. Silly Syntax requires 16K Extended Basic (32K for disk version). For \$19.95, you get a user guide and a tape containing the Silly Syntax game and 2 stories. You can create your own stories or order story tapes from the selection below.

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Continued from page 43

work area. Open the plastic tube (or whatever the Extended Color Basic ROM came packaged in), and slide the ROM, pins down, onto the foil or foam. One end of the ROM will have a notch; this will face in the same direction as the Color Basic part. Lift the ROM from the foam by its ends, and set it on socket U28. If the pins are a bit too wide to fit directly into the socket, place the ROM back on the foam and "roll" it slightly so the pins come together. Try again, and when the pins are exactly right, press the ROM into its socket.

Check again for any debris or tool you may have left in the computer, temporarily set the grey cover back on (you can leave the metal shield off, and hook up the video screen. Power up; after a short pause you should now receive the message:

EXTENDED COLOR BASIC 1.0
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There is little you can do incorrectly making this upgrade, but should the message not appear, turn the machine off immediately. You may have inserted the ROM upside down; bent one or more pins underneath the part when inserting it in the socket; not completely inserted it in the socket; or damaged the ROM. These ROMs are electronically stable, and if you have followed the instructions carefully, the upgrade will work immediately.

Now type PRINT MEM. You will be surprised to see 8487, only about half of 16K. Since Extended Basic has many graphics functions, it automatically grabs some of the memory for itself. To retrieve part of it (if you don't plan to use high-resolution graphics), enter: PMODE0: PCLEAR1. Your Print Memory command will reveal 13095, which is the best you can get (for the moment — more at a later time).

Memory Upgrades

Newer Color Computers can be simply upgraded to 32K, with 64K possible through modification (see Bob Rosen's TDP-100 review in this issue). If you already have Extended Color Basic, check the top of the Color Basic ROM (U3) for the revision number, and mark this down. Now open the machine, remove the Extended Color Basic ROM (U28), and set it on a piece of foil or non-static foam. Re-cover and reconnect the machine, and mark down the Color Basic

sign-on message revision. The purpose of this redundancy is that some Color Computers are reported to have ROMs stamped 1.1, whose sign-on message reads 1.0, or which are stamped 1.0 and whose sign-on message reads 1.1. Someone goofed on a batch of these, but if either reads 1.1, you've got the new revision. Chances are you have the 1.1 ROM if you have an E revision board. Now disconnect the power, open the case, and replace the Extended Color Basic ROM (remember the notch points toward the back).

To do the piggyback-style 32K upgrade, you will need eight more 4116 dynamic RAMs and a single 33-ohm resistor ($\frac{1}{4}$ watt, 5%; Radio Shack Cat. No. 271-007 is $\frac{1}{2}$ watt, 10%, which is fine).

For the Radio Shack-style 32K upgrade, which can be modified further for 64K use, you will need an E revision board, a version 1.1 Color Basic (not 1.1 Extended Basic), a 33-ohm resistor, and eight 4164 dynamic RAMs. If you do not have the E-board or the 1.1 Color Basic, hold off on this modification. At your nearest Shack computer center, trade in your 1.0 Color Basic ROM for a version 1.1 (there is a charge for this). I'll cover the D-board modification details in a later issue of *The Color Computer Magazine*.

Piggybacks First

The single cheapest way to upgrade your 16K Color Computer is by piggybacking a second set of 16K dynamic RAMs atop the first. It can cost only \$8, and the process is simple and dull; but don't try any shortcuts.

1.) Remove the new set of 4116 dynamic RAMs from their packaging; set them on aluminum foil or conductive foam.

2.) Locate the notch at one end of a RAM integrated circuit. Count down along the left side to pin 4.

3.) With a small screwdriver, lift pin 4 straight out, bending it at the body of the IC.

4.) Unplug and open the computer, remove the metal shield, and identify the 16K RAMs (see Photo 5).

5.) Remove each RAM with a thin screwdriver, using a gentle rocking motion on each end.

6.) Place the old RAMs on the foil or conductive foam, pins down.

7.) Squeeze the pins of the new RAMs gently together so the pins point straight down.

8.) Place each new RAM on top of each old RAM (both pointing in the same direction), with each pin of the top RAM

touching the matching pin on the bottom.

9.) With a 25-watt soldering iron (Radio Shack Cat. No. 64-2070 or Weller WTCP) and fine solder (Radio Shack Cat. No. 64-005), solder each pin to the one below. Solder with the pins still touching the foil or foam. Use very little solder; this is very important! Also, if the RAM gets too hot to hold comfortably while soldering, stop and let it cool off.

10.) When all 17 pins are soldered (all but pin 4), you will have a double-decker RAM. Insert this memory back in its socket, with the notch pointing toward the back.

11.) Complete the remaining memory chips, and insert each into its socket.

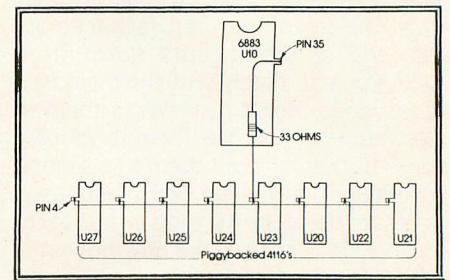


Figure 1. 32K piggyback upgrade. Bus wire connects all pin 4s together on the second bank of 4116 RAMs.

12.) Loop a piece of thin bus wire (such as Radio Shack Cat. No. 278-1341) around each pin 4, connecting them together in a line (see Figure 1). Solder the loops to each pin 4.

13.) Very gently (!) lift the notched end of the 6883 chip (U10) up from its socket about $\frac{1}{8}$ inch.

14.) The first pin to the right of the notch is pin 40. Count down to pin 35, and solder one end of the 33-ohm resistor to this pin 35.

15.) Press U10 back into its socket; bend the resistor sharply about $\frac{1}{4}$ inch above U10, and angle it back toward the RAMs.

17.) Solder the free end of U10 to the nearest point on the bus wire (see Figure 1).

18.) Check that neither the resistor nor the bus wire is shorted to any other point; check that the RAMs are in their sockets and no pins are bent underneath; check that U10 is properly pressed back into its socket; check that all RAMs are inserted in the correct direction.

19.) Check for leftover bits of wire or solder, close the case, restore power and type: PRINT MEM. 24871 should be the response with Extended Color Basic, 31015 with Color Basic.

Potential problems:

■ Still get only 8487 as response to the Print Memory command? Check for an

unsoldered pin in the piggybacking; check that the resistor is the correct value and is soldered properly; check that the piggybacked RAM is not turned around.

■ Get between 8487 and 24871? Check for proper soldering of all pins; check that the resistor is the correct value and soldered properly; a RAM may be bad.

■ Machine crash after sign-on message? Check for proper soldering of all pins; check for good connection to pin 4 on all RAMs; a RAM may be bad.

■ Machine lock up from the start? Check that no pins bend underneath or go into the sockets; check for a solder short between pins; check that no pins slide outside of the sockets; make sure RAMs are turned in the right directions.

Radio Shack-Style 32K

Refer to the jumpers in Photo 6. If your machine is already 16K, then the 16K jumpers (not marked with dots in the photo) should be in the 16K/32K positions. If not, move them from 4K to 16K/32K. The remaining four jumpers must now be moved from the 4K/16K positions to the 32K position.

Locate the jumper marked R83. Take a 33-ohm resistor and loop its ends, one on each jumper pin (see Figure 2). For security, solder it in place. Next locate the jumper marked HI/LO. Wind a small piece

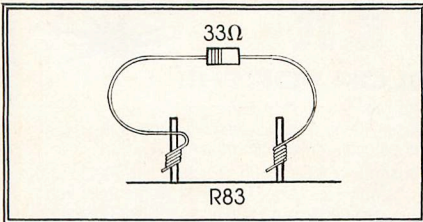


Figure 2. Mounting a 33-ohm resistor on the posts labeled R83.

of bus wire around the center pin and either the left or right pins (not both). Solder for security. Finally, identify the capacitors (shown in Photo 6) marked C31, C35, C45, C48, C61, C64, C67, and C70. Cut these out with sharp diagonal cutters.

Check for bits of wire, etc., restore the case and power. You should have 24871 bytes of memory in Extended Basic, 31015 in Color Basic.

Clearing Up the Video

I don't like television. Even if the Color Computer had the greatest RF (Radio Frequency) output there could be, I still wouldn't like it. Fortunately, I have an excuse to change it because the results are

Please turn to page 46

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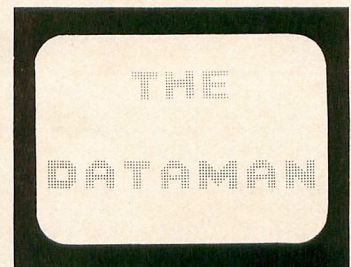
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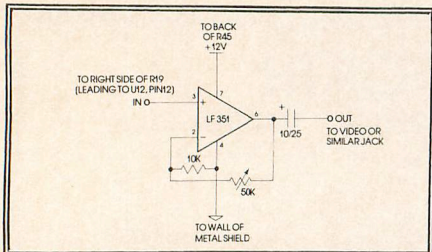


Figure 3. Schematic diagram of the TV Buff. LF351 can be substituted by TL071, TL081, or TL091.

so dramatic; I call it the tiny video buffer — TV Buff.

Figure 3 contains the schematic of a small circuit that will give standard NTSC video output for virtually any monitor on the market. The picture is crisp, and the level is variable to match the varying sensitivities of new and surplus monitors. I think you'll like it better than TV any day.

You can pick up all the parts at Radio

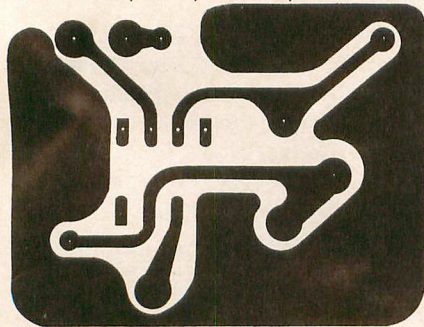


Figure 4. Circuit board layout for the TV Buff.

Shack. The 10K resistor is 271-1335, the 50K variable is 271-219, the electrolytic capacitor is 272-1013, and the integrated circuit is 276-1716 or 276-1745. The circuit board is pictured in Figure 4, and the parts layout is shown in Figure 5. A complete unit or a kit of parts for the TV Buff is available at low cost from World Electronics, 177 27th St., Brooklyn, NY 11232.

The TV Buff is easy to build using the PC board pattern, on perfboard, or just point-to-point on terminal strips; it can be mounted with double-face tape atop

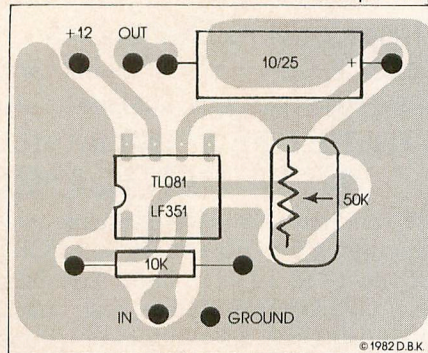


Figure 5. Parts placement for the TV Buff. The view is from the top of the board.

the RF modulator box at the back of the computer (see Figure 6 and Photo 7). No special construction is needed, but watch the polarity of the electrolytic capacitor. Attach the TV Buff input to the

right side of R19; +12 volts is found at the back of R45; ground can be any point on the metal shield wall; and the output is fed to a jack of your choice

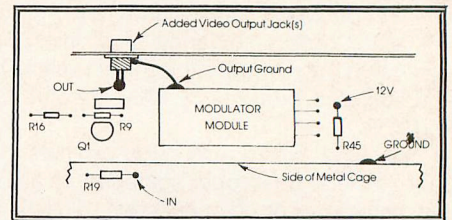


Figure 6. Connection points inside the Color Computer for the TV Buff. A phono jack can be added to the case for video output.

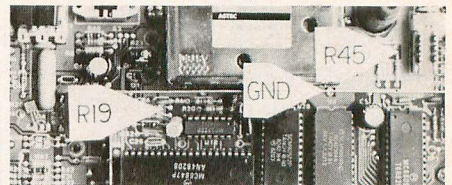


Photo 7. The video buffer installed. It is mounted with double-faced tape on the RF modulator. Be careful to use thick tape so the buffer bottom is not shorted on the metal case.

(Photo 8). I used ordinary phono jacks, which are compatible with my monitor input, and 75-ohm cable (Radio Shack Cat. No. 15-1535 is a 6-foot assembly, 278-1324 is sold by the foot for longer lengths). Be sure to ground the outside (shield) of the jack. The plastic case is soft and can be cut easily with a fine coping

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saw blade, and filed smooth.

Clean any debris from the computer, connect the monitor, restore the power, and adjust the 50K variable resistor for an ideal picture. Be sure you use a TL071/081/091 or LF351 integrated circuit; a slower speed (741 or equivalent) will give you a smeared, contrastless image.

All the modifications are now com-

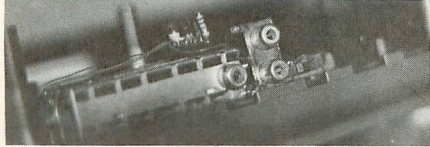


Photo 8. Extra video jacks can be installed at the back of the computer; use coax jacks or phono jacks (shown here).

plete, and should look something like Photo 9. Also visible in the photo is a piggyback board — something for the future.

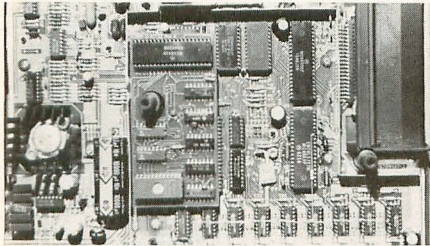


Photo 9. Changes in place: 32K modification with strap wire and 33-ohm resistors, and video buffer. Also installed is a lowercase generator, the subject for the future.

Coming Up

In this next year, here's what you can expect from Custom Color Applications: coming up next month, an input/output port totally transparent to disk drive operation; then a rundown for the Lowerkit II, a true lowercase character generator project; an EPROM programmer and

ROM/RAM pack; tips and pointers on the care and feeding of you Color Computer; and — yes, you heard it here first — 1 megabit bubble memory.

If you have problems with these mods, you may write to me in care of *The Color Computer Magazine*. Please enclose a self-addressed stamped envelope. Till next time. ■ ■ ■

Article Specs:

Hardware
4K to 16K upgrade
16K to 32K upgrade (two methods)
Color Basic to Extended Color Basic upgrade
NTSC Output Modification

Parts and Equipment required:

For 16K upgrade:

Color Computer Technical Reference Manual R.S. Cat. No. 26-3193 \$14.95
Conductive foam pads for static-free solid metal work surface workbench or Static-free workbench pad #WS-9010 \$15 plus shipping from Wescorp, 1155 Terra Bella Ave., Mountain View, CA 94043
Phillips-type screwdriver
Eight 4116, 250 nS dynamic memories Under \$10
snips
Aluminum foil or black static-free foam
IC inserter Radio Shack Cat. No. 276-1574 \$6.95
Extended Color Basic Kit R.S. Cat. #26-3018 \$99 or Extended Color Basic ROM Cat. #AXX-3054 \$64.16 From Radio Shack National Parts through Computer Centers only.

For 32K upgrades:

Piggyback:

Eight 4116 dynamic RAMs
One 33-ohm resistor (1/4 Watt, 5%: R.S. Cat. No. 271-007, 1/2W, 10% is ok)
25 Watt soldering iron R.S. Cat. No. 64-2070 or Weller WTCP
fine solder R.S. Cat. No. 64-005
thin bus wire R.S. Cat. No. 278-1341

R.S.-Style upgrade:

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Version 1.1 Color Basic
33-ohm Resistor
Eight 4164 Dynamic RAMs \$48
sharp diagonal cutters

For the TV Buff:

10K Resistor R.S. Cat. No. 271-1335
50K Variable R.S. Cat. No. 271-219
Electrolytic Capacitor R.S. Cat. No. 272-1013
Integrated Circuit: TL071/081/091 R. S. Cat. No. 276-1716 or 276-1745 or LF351 or, complete kit of parts (or unit) from World Electronics, 177 27th St., Brooklyn, NY 11232 (212) 499-5400
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Tick Talk

by Richard Ramella

I WROTE TICK TALK, an Extended Color Basic program, to help my children learn to tell time the old-fashioned way — on a round clock with hands. The program displays a moving graphic of a clock face. Random times are shown, the learner types in the time, and the program tells you whether the answer is right or wrong.

Tick Talk is not Robbie the Robot. You can't just chain the child to the computer and expect him to come away able to tell time. You must teach the concepts, and help the child get into the program.

Please turn to page 50

16K
Extended
Color
Basic



illustration by Jeff Jennings

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Continued from page 48

When the child begins to understand what's happening, then you can slip away and let the time game continue.

In teaching my children, I narrowed the idea of time telling to a simple set of rules:

- To avoid confusion, have the child state the time as hours and minutes, with each pronounced as a separate number. In this style, the time would be seven-fifteen and eleven fifty-nine. Don't say fifteen after seven, a quarter past, or a minute before noon as this can confuse the child. Teach the simple style of writing the time — 7:15, 11:59 or 9:02. This is the way it appears in the program.
- All traditional clocks have at least two hands. The big, or minute, hand takes one hour to go from the number 12 all the way around to the 12 again. The small, or hour, hand takes an hour to move from one number to the next.
- To tell time, you first say the hour and then the minute.
- The hour is the number the hour hand points to, or the last number it passed.
- The minute hand is at zero when it's pointing at 12; add five minutes for every number it passes beyond that.

The minute concept is toughest for the child to grasp. It doesn't make sense that a three can turn into a 15 or a nine into a 45. I approached this from different sides and let the logic sink in. I let my kids count all the minutes after the hour; then pointed out that they could use the numbers one through 12 and count by fives. I suggested they multiply the minute hand number by five. I told them that the 60 minutes of an hour are divided into 12, five-minute parts marked by each number, and suggested how they could gauge the one to four minutes between the two minute numbers.

Understanding this, the child can tell time. Later, you can explain the finer points, such as A.M. and P.M., stating minutes before and after.

Now, let's run through the program so you can see what the learner faces.

The program starts with a brief title. Then the clock face is drawn and the hands tick-tock their way through one hour (very fast). Next, the screen offers a choice of Lesson One, which presents exact hour times such as 1:00 and 3:00, or Lesson Two, which randomly selects and displays any time from 1:00 to 11:59. When you make the lesson selection, the program notes that the graphic clock's hands are different colors: orange for the hour hand and blue for the minute hand.

The program then gives instructions on how to type in the time as read on the graphic clock. At this point, the child

needs your help. Make sure the child understands that the entry must conform to the hours and minutes Arabic style — 7:00, 11:09, 8:41, and so on. Also, it's a good idea to have the child say the times he types in, and to speak the hours and minutes separately. This might be a good time to explain that if the time is exactly on the hour, you can express it as eight o'clock or one o'clock.

In the time game (or drill), the hour hand points at a number, and the minute hand starts at 12 and revolves until it reaches the time to be read. The learner can study the time for as long as necessary. Then press Enter; the clock disappears and the prompt AND THE TIME IS... appears. The learner types in the time in the correct style — 5:38 — and presses Enter. The program responds either with RIGHT or, if the answer is wrong, it gives the correct answer.

To go from Lesson One to Lesson Two, restart the program by pressing Break and typing RUN. At the option menu select Lesson Two.

Because a precise statement of time is not often needed in the real world, I have built a bit of grace into the program. If the child's answer is right or one minute on either side of right, the computer accepts the answer as correct. If you are a stickler for precision or the child has ad-

vanced to a point where exactitude is best, change line 1220 to read:

```
IF K = J AND L = P THEN PRINT  
"RIGHT";: GOTO 1260.
```

The most important thing to remember is not to force the child to play the game beyond the point of his interest. If you haven't adequately explained time telling, the game will be unbeatable; if he loses interest, he'll learn nothing more during that session anyway.

I'd like to stick around and help with all this, but I discovered today that my kids can't tie their shoelaces, and I'm going to write a program that tells them how.

Line By Line

120-210: LINE and DATA statements move clock hands.

220-360: CIRCLE command draws the clock, and DRAW commands form clock numbers.

950-1060: FOR...NEXT loop establishes main clock routine. Timer loops and resetting the minute variables A(X), and hour C(X) variables keeps the clock running. Set the clock by replacing line 880 with an INPUT for the hour figure and line 920 with the statement A=1, to start the clock on an even hour. Add a second hand with with A(X) coordinates and appropriate timer loops and LINE commands. ■ ■ ■

Program Listing 1

```
100 REM * TICK TALK * TRS-80 EXTENDED COLOR BASIC / RICHARD RAMEL  
LA  
110 CLS(0)  
120 DATA 128,26,138,28,149,30,159,34,168,39,174,44,179,49,185,54,  
186,60,188,65,193,70,195,75,196,81  
130 DATA 196,86,197,91,199,96,196,102,196,107,195,112,194,117,193  
122,189,127,186,133,184,138,179,143  
140 DATA 175,148,166,154,156,158,147,162,137,164,129,166,118,164,  
108,162,101,158,91,154,82,148,78,143,73,138  
150 DATA 71,133,68,127,64,122,63,117,63,112,60,106,60,101,59,96,6  
1,91,60,85,60,80,63,75,65,70,68,64,70,59  
160 DATA 73,54,79,49,84,43,90,38,99,34,109,30,119,28  
170 DATA 128,36,138,40,145,44,153,48,160,52,167,54,175,60,178,64,  
180,68,182,72,184,76,185,80,186,84,187,88  
180 DATA 187,92,188,96,187,100,186,104,186,108,185,112,184,116,18  
2,120,180,124,178,128,175,132,172,136  
190 DATA 168,140,163,144,153,151,140,152,128,156,118,154,108,151,  
95,144,90,140,86,136,82,136,81,132  
200 DATA 78,128,76,126,74,120,72,116,71,112,70,108,70,104,69,100,  
68,96,69,92,69,88,70,84,71,80,72  
210 DATA 76,74,72,76,68,78,64,81,60,84,56,88,52,93,48,100,44,108,40  
220 A$="BM119,10;E4;D17;L3;R6"  
230 B$="BM130,9;E3;R5;F2;D4;G7;D4;R9"  
240 C$="BM205,88;E3;R6;F3;D5;G3;L3;R3;F3;D5;G3;L6;H3"  
250 D$="BM135,172;H3;L6;G3;D12;F3;R6;E3;U3;H3;L6;G3"  
260 E$="BM54,89;H3;L6;G3;D5;F3;R6;E3;U5;D15;G3;L6;H3"  
270 F$="BM60,125;H3;L6;G3;D5;F3;R6;E3;U5;D5;G3;F3;D5;G3;L6;H3;U5;  
E3"  
280 G$="BM71,156;U2;R12;D2;G1;D2;G1;D2;G1;D2;G1;D2;G1;D2;G1;D2;G1;D2;G1;  
290 H$="BM185,153;L9;D8;R7;F3;D5;G3;L5;H3"  
300 I$="BM205,140;U21;G10;R15"  
310 J$="BM180,29;E4;D18;L3;R8"  
320 K$="BM200,55;E3;R5;F2;D7;G7;D4;R9"  
330 L$="BM42,55;E4;D18;L3;R8"  
340 M$="BM53,54;E3;R4;F3;D12;G3;L4;H3;U12"  
350 N$="BM66,27;E4;D18;L3;R8"  
360 P$="BM76,27;E4;D18;L3;R8"  
370 DIMA(120),C(120)  
380 FOR B=1 TO 120  
390 READ A(B)  
400 NEXT  
410 FOR B=1 TO 120  
420 READ C(B)  
430 NEXT  
440 PRINT @ 262,"TICK TALK: TELLING TIME ";  
450 PRINT @ 328,"BY RICHARD RAMELLA ";  
460 FOR T=1 TO 2500
```

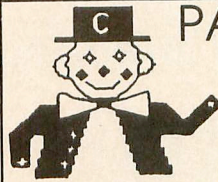
Listing continued on page 51

Listing continued from page 50

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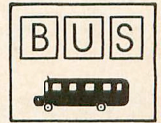
470 NEXT T
480 CLS(0)
490 PMODE 3,1
500 PCLS(1)
510 SCREEN 1,1
520 CIRCLE(128,96),100
530 PAINT(1,1),3,8
540 PAINT(255,1),3,8
550 FOR T=1 TO 500
560 NEXT T
570 DRAWAS: DRAW B$: DRAW C$: DRAW D$: DRAW E$: DRAW F$: DRAW G$:
DRAW H$
580 DRAW I$: DRAW J$: DRAW K$: DRAW L$: DRAW M$: DRAW N$: DRAW P$
590 GOSUB 1300
600 PRINT "WILL YOU TRY..."
610 PRINT "-- LESSON 1"
620 PRINT "-- LESSON 2"
630 PRINT: INPUT "ENTER NUMBER";QQ
640 IF QQ<>1 AND QQ<>2 THEN CLS(0): GOTO 600
650 CLS(0)
660 PRINT "OUR CLOCK HANDS HAVE COLORS.": PRINT
670 PRINT "THE FAST MINUTE HAND IS ";
680 PRINT CHR$(143+32)
690 PRINT
700 PRINT "THE SLOW HOUR HAND IS ";
710 PRINT CHR$(143+112)
720 PRINT
730 PRINT "TO GO ON, TAP ENTER"
740 IF INKEY$="" GOTO 740
750 CLS(0)
760 PRINT "TIME TO PRACTICE TELLING TIME."
770 PRINT "THE CLOCK WILL SHOW A TIME."
780 PRINT "WHEN YOU KNOW IT, TAP ENTER."
790 PRINT "AND TYPE IT IN THIS WAY..."
800 PRINT: PRINT "-----"
810 PRINT "      HOUR:MINUTES"
820 PRINT "      7:15"
830 PRINT "      ----": PRINT
840 PRINT
850 PRINT "WHEN READY TO START, TAP ENTER"
860 IF INKEY$="" GOTO 860
870 SCREEN 1,1
880 J=RND(11)
890 Z=J*10-1
900 IF J>3 AND J<6 OR J>8 THEN Z=Z+4
910 IF J<4 OR J=6 OR J=8 OR J=10 OR J=11 THEN Z=Z+2
920 IF QQ=1 THEN A=1 ELSE A=RND(119)
930 P=(A/2)-.5
940 IF QQ=2 AND A/2=INT(A/2) GOTO 920
950 FOR X=1 TO A STEP 2
960 COLOR 3,1
970 LINE(128,96)-(A(X),A(X+1)),PSET
980 COLOR 8,1
990 LINE(128,96)-(C(Z),C(Z+1)),PSET
1000 IF X=A GOTO 1070
1010 LINE(128,96)-(A(X),A(X+1)),PRESET
1020 IF X>1 AND (X-1)/24=INT((X-1)/24) THEN LINE(128,96)-(C(Z),C
Z+1)),PRESET: Z=Z+2
1030 IF Z>119 THEN Z=119
1040 IF (X-1)/10=INT((X-1)/10) THEN G=3 ELSE G=8
1050 PSET(A(X),A(X+1),G)
1060 NEXT X
1070 IF INKEY$="" GOTO 1070
1080 LINE(128,96)-(A(X),A(X+1)),PRESET
1090 LINE(128,96)-(C(Z),C(Z+1)),PRESET
1100 CLS(0)
1110 PRINT "AND THE TIME IS...";
1120 W$=INKEY$
1130 IF W$="" GOTO 1120
1140 IF W$=CHR$(13) THEN PRINT @ 256,"";: GOTO 1180
1150 Z$=Z$+W$
1160 PRINT @ 170,Z$;" ";
1170 GOTO 1120
1180 FOR T=1 TO LEN(Z$)
1190 IF MID$(Z$,T,1)=":" THEN K$=LEFT$(Z$,T-1):L$=RIGHT$(Z$,
(LEN
Z$)-T)): K=VAL(K$): L=VAL(L$)
1200 NEXT T
1210 Z$=""
1220 IF K=J AND L=P OR K=J AND L=P+1 OR K=J AND L=P-1 THEN PRINT
"RIGHT ";: GOTO 1260
1230 PRINT "NO, THE TIME IS";J;";":
1240 IF P<10 THEN PRINT "0";
1250 PRINT P;
1260 FOR T=1 TO 1000
1270 NEXT T
1280 CLS(0)
1290 GOTO 870
1300 Z=1
1310 SCREEN 1,1
1320 FOR X=1 TO 119 STEP 2
1330 COLOR 3,1
1340 LINE(128,96)-(A(X),A(X+1)),PSET
1350 COLOR 8,1
1360 LINE(128,96)-(C(Z),C(Z+1)),PSET
1370 SOUND 176,1: FOR T=1 TO 50: NEXT T: SOUND 89,1
1380 IF X=119 THEN FOR T=1 TO 500: NEXT T
1390 LINE(128,96)-(A(X),A(X+1)),PRESET
1400 H=(X+1)/2
1410 IF H/12=INT(H/12) OR H=59 THEN LINE(128,96)-(C(Z),C(Z+1)),PR
ESET: Z=Z+2
1420 NEXT X
1430 RETURN
1440 END

```

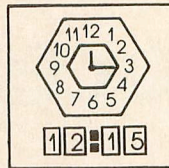


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Color Computer/51

A Guide to Word Processors

by Terry Kepner

MOST PEOPLE THINK of games when you mention the Color Computer, probably because those are the items on display in most stores. The Color Computer though, is more than a video game machine, it's a serious tool for the businessman, student, or homeowner with a limited budget.

One of the more universal uses of any micro computer is word processing, using the computer as an electronic, super typewriter. Radio Shack led the field when the Color Computer was introduced with their Scripsit ROMpak. With a list price of \$39.95, it was a reasonable introduction to the capabilities of word processors. However, ROMpak Scripsit was not a powerful program, and was tailored only to the Radio Shack printers (or printers with the same specifications). If you wanted more than Scripsit could offer, or you had a non-Tandy printer, you had to either write your own word processor, or do without.

Several companies have moved into this void, with a variety of programs that are sure to match any need and any budget. This article will examine six of the word processors currently on the market for the Color Computer.

Introduction

Before we begin, though, I have to lay down a few guidelines. No one word processor is everything to everybody. What I consider the best program on the market, will be useless to someone else. What I call simple, others would call complex. My needs (automatic table of contents generation, indexing, and proportional spacing support for my book) are not the needs of the homeowner who wants to send a letter to his congressman. In this article I'll strive to present each word processor's features as objectively as possible, and to report my experiences with each one.

Table 1 summarizes each word processor's features. Not all the commands of the more advanced programs are listed, only those roughly comparable to the bare bones processors. The first line of

the table tells you the program's medium; two are available on ROMpak cartridges, two are Basic programs and the rest are available on disk and tape (except Disk Scripsit).

The next line tells whether the program is written in machine-language or Basic. All the disk programs (except Scripsit) can read the disk directory from within the program, most can KILL and COPY disk files.

One important consideration in using a word processor is the amount of room left for text after you load the program. The next four lines of the table summarize this information for the 16K and 32K computers. Several of the processors use a graphics page to display upper/lower-case letters, but only one lets you turn off the graphic display and use the Radio Shack text screen, giving you additional memory should you need it. The display size equals the number of characters across the screen by the number of lines. The graphics-assisted word processors have higher character/column counts than the standard screen (32 by 16).

Video Window is a function that lets you see the text as it will appear on paper, so if you're trying to set up several columns of data (such as Table 1, 100 characters wide), which are larger than the screen width (32), you can check to make sure the columns line up before you send it to the printer.

On-screen tabs let you set up positions you want to tab to when creating your document, as I did with Table 1.

A line-oriented word processor lets you create, edit, and move text in blocks of lines. Character-oriented means you can create, edit, and move blocks of text regardless of whether they start or stop at the beginning, middle, or end of a line.

Headers, footers, and page numbering refer to special text messages at the top and bottom of each page (book title, page number, and so on). Block text movement means moving text from one position to another in your document. String find and replace let you locate and change strings of characters in your text (i.e., find and change all occurrences of

Terry to Bob). Hyphenation lets you put hyphenated words at the end of lines, instead of dropping the entire word to the next line; it spaces the words and lines more evenly.

The typewriter mode sends what you type to the printer as soon as you hit Enter (sort of a line-by-line typewriter).

The printing parameters are important for word processing. Margin control gives you control over the left, right, top, and bottom margins on the page. Control over the width of each printed line is very important (the number is the highest column count allowed). The number of lines printed per page, starting page number, and line spacing all make it easier to prepare reports. If you have a non-Radio Shack printer, being able to change the baud rate is important. Scripsit lets you print your documents in all capitals if you so desire.

Printing flush left (all text starts at the leftmost column), flush right (all text lines up its rightmost character on the right margin), centering (putting each line in the middle of the page), and right justification (making the right edge of the page line up against the right margin) can really spruce up a business letter.

Underlining, elongated text, and embedded coding (the ability to add special coding for setting up the printer to do special tasks like italics, bold face, back-spacing, super and sub-scripting, and changing print fonts) depend on which printer you're using. If you have a printer with these abilities, carefully choose the word processor you want to include embedded codes. Proportional spacing, spool files (a disk text file created for printing later), and draft copies are nice extras, but not essential. Most of the more powerful word processors let you chain several files together into one long printed document, which can be much longer than would fit into memory for editing. If you intend to use the word processor to print several pages of text on non-tractor-feed paper, the single sheet feed option stops the program after each printed page for you to put in a new page of paper.

The manuals are important for learning and using the programs. One of the most important aspects of any manual is its summary page, one or two pages that list the commands and their syntax. I forget what every command does and often need a quick reference card to remind me of what I can do and how to do it. For the most part I found the manuals well-written, an unusual situation in my

Please turn to page 54

Table 1 — Features

FEATURE	SCRIPFIT		TELEWRITER		SUPER COLOR			TEXTPRO		WORDCLONE	TEXTSET - I	
	C	D	T	D	T	C	D	T	D	T	T	
Disk/Tape/Cart. BASIC/M.L.	ML	ML	ML	ML	ML	ML	ML	ML	ML	B	B*	
Available Memory (16K)	15134	1433	7800	1616	8000	15200	6500	7000	5140	2300	6400	
(32K)	31528	17817	23800	17616	24000	31000	22500	23000	22000	8000	16000	
Memory w/o Graphics (16K)	NA	8600	NA	NA	NA	NA	NA	NA	NA	NA	NA	
(32K)	NA	25000	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Display size	32 x 16	32 x 16	51 x 24 64 x 24 85 x 24			32 x 16	32 x 16	32 x 16	32 x 16	32 x 16	50 x 23	32 x 16
Video Window	Y	Y	N	N	W*	W*	W*	N	N	N	N	
Upper/Lowercase	N*	Y	Y	Y	N*	N*	N*	N*	N*	D*	N*	
Cursor Control (Arrow Keys)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
On-Screen Tabs	Y	Y	N**	N**	Y	Y	Y	N	N	N	N	
Line or character oriented	C	C	C	C	C	C	C	L	L	L	L	
Headers	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Footers	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	
Page Numbering	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Block Text Movement												
Move	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Copy	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Delete	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
String Find	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	
String Replace	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Hyphenation	Y	Y	N**	N**	N	N	N	N	N	N	N	
ASCII files (can read or write files acceptable to BASIC)	Y	Y	A*	A*	Y	Y	Y	Y	Y	N	Y	
Typewriter Mode	N	N	Y	Y	Y	Y	Y	N	N	Y	N	
Printing Parameters												
Margin Control	M*	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	
Line width	Y-132	Y-132	Y-127	Y-127	Y-255	Y-255	Y-255	Y-255	Y-255	N-50	Y-80	
Lines/page	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	
Page number	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Line spacing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Baud rate	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
All Capitals	Y	Y	N	N	N	N	N	N	N	N	N	
Print Flush:												
Left	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	
Right	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	
Centered	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	
Right Justified	N	N	N**	N**	Y	Y	Y	Y	Y	N	Y	
Underline	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Elongated text	N	Y	Y	Y	Y	Y	Y	N	N	N	N	
Above two user controlled	N	Y	Y	Y	Y	Y	Y	N	N	N	NA	
Embedded Codes	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Change Fonts	N	Y	Y	Y	Y	Y	Y	N	N	N	N	
Proportional	N	L*	N	N	N	N	N	N	N	N	N	
Spool File	N	Y	N	N	N	N	N	N	N	N	N	
Single Sheet	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	
Draft copy	N	N	N	N	N	N	N	Y	Y	N	Y	
Doc. Chaining	N	N	Y	Y	Y	Y	Y	N	Y	N	N	
Manual												
Table of Contents	Y	Y	N	N	Y	Y	Y	N	N	N	N	
Index	N	N	Y	Y	Y	Y	Y	N	N	N	N	
Glossary	N	N	N	N	Y	Y	Y	N	N	N	N	
Summary Page	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	
Explanations (Excellent/Good/Fair/Poor)	G	G	F	F	E	E	E	P	P	F	F	
Price	\$39.95	\$59.95	\$49.95	\$59.95	\$49.95	\$49.95	\$99.95	\$29.95	\$79.95	\$18.95	\$34.95	

** = Telewriter 64 has these features.

A* = Separate program converts files to ASCII and back, except Telewriter 64 which is compatible.

L* = Proportional not directly supported, but can be used.

B* = Not compatible with R/S Disk Basic

Continued from page 52

computer-using experience. The ratings used for the manuals are relative among the group examined.

The Programs

The word processors are divided into two categories: Basic programs, and machine-language programs. The Basic programs offer customization advantages. If you know a little programming you can set them up to operate your printer's special features. None of the printer parameters are selectable from menus, you have to go into the programs and change lines to reflect your printer's baud rate, line width, line spacing, lines per page, and so forth. While their text editing capabilities may be slight, their flexibility and ease of alteration more than make up for these deficiencies.

Not all of each processor's commands are reviewed, only those I considered universally important, (i.e., TEXTSET-I has a command, PARK, that puts the program's logo on the screen so you can leave the machine on and people will know you have a text in memory). As another example, all the programs can read and write files on cassette tape, also

all except WordClone lets you load another file from tape (or disk for the disk programs) onto the end of a file already in memory. If you have a specific question about what a program can or cannot do, call the producer of the software.

WordClone

Illustrated Memory Banks
P.O. Box 289
Williamstown, MA 01267-0289
(413) 663-9648

WORDCLONE IS THE simplest word processor, turning your computer into a super typewriter. You type each line of your text, check it for errors (backspace and retype if you find errors), then press Enter. That line goes immediately to your printer. Its primary advantage over a typewriter is that you can edit each line for typographical errors before it prints.

You can store up to 46 lines of text on tape for later use, so if you have a repetitive letter or circular, you can type it in and print it as many times as you need. The instructions fit on an 8-1/2 inch by 11 inch paper—once you've read them, you

can throw them away and use the program.

Margin controls, baud rate, and other printer controls are controlled by changing the program and saving the new version to tape. As an additional bonus, you can remove the program lines that generate the upper/lowercase characters (a 50 by 23 screen) and include them in your own program. IMB gives instructions explaining how to do that. If all you want is a simple, "load it, type it in, print it word processor," check out WordClone.

TEXTSET-I

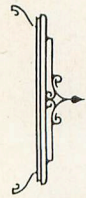
Anteco (Antenna Electronics Company)
4220 Clay Avenue
Fort Worth, TX 76117
(817) 281-8403

TEXTSET-I is a slightly more sophisticated program, which lets you type 200 lines of text (500 if you have a 32K machine), and edit them at will. Insert, delete, list, replace, and line centering are all supported. Being a line-oriented program, you must specify the line number of the target line for editing, replacing, inserting (above), and deleting. The

Note:
These are the
programs that
have received such
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line numbers are not displayed on the screen, but commands for determining the number of specific lines are included in the editor.

If you need, you can print the file in draft form, with each line numbered and exactly as it appears on the screen. When you're finished with the file, you can save it to tape (in ASCII format, for easy loading in Basic), or print it specifying left and right margins, line spacing, justification, paging (skip paper perforations), lines per page, and the number of copies you want.

Unfortunately, this program won't work in Disk Basic.

Scripsit

Radio Shack
One Tandy Center
Fort Worth, TX 76102
(817) 390-3944

RADIO SHACK'S PROGRAM is the next step in sophistication. The cartridge version gives you the most memory, but is the less powerful of the two. Both versions are character-oriented instead of line-oriented. This provides you with additional control over your text,

making it easy to move sections of text from one position in memory to another, or to duplicate or delete sections. If you decide you want to move paragraph (or sentence), 20 to the first position, you can do it with only a few keystrokes. Inserting text in the middle of a sentence can be done character by character or by inserting a blank line and typing over the blanks until you're finished with the insert. Closing up the gap created by line insert is done by pressing the Clear key.

One difficulty with printed text is making the right margin appear even. Most word processors tackle this problem by using justification to force each line to terminate at the right margin by putting additional spaces between words until the right margin is reached. Rather than use that method, which can lead to odd looking results when words are separated by four or five spaces instead of the normal one space, Scripsit uses hyphenation to reduce the number of blank spaces at the end of each line. After you enter the text, set the screen width to match the paper line width and invoke hyphenation. Scripsit scans the document and stops at each word that can be hyphenated and asks if you want it to do

so. Responding yes moves the front portion of the word up to the previous line, and Scripsit looks for the next word to be hyphenated.

Scripsit includes a video window option that lets you see the text as it appears on paper. This window moves up and down, and left and right by the arrow keys. You can enter and edit information in your text while viewing it with the window option.

Headings (printed at the top of pages) and footings (printed at page bottoms) are supported by Scripsit. They make your documents appear more formal, giving the document name and page number on every page. Headers (or footers) are generally used for printing chapter titles on each page of a chapter. Headers and footers support page numbering.

Printing options are limited to line width, left margin, hyphenation, lines per page, first page number, line spacing, and all capitals (the entire document prints in uppercase letters only).

Cartridge Scripsit assumes you're using standard Radio Shack printers.

Disk Scripsit has all the features of Car-

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Continued from page 55

tridge Scripsit, and adds these features: disk file saving and loading, file spooling, disk space map display, upper/lowercase character display, and print control.

Spool is the most powerful feature added. Rather than waiting for the Color Computer to print your file at 600 baud, you can send the file to disk in a few seconds, then use the spooling function to send the disk file to the printer while you use Scripsit for more word processing. The spool routine can link together separate files into a single long file that would not fit into the memory. Note: If you create a spool file bigger than the computer's available memory, you won't be able to edit the last portion of text after the first part fills memory.

Underlining and text elongation are two features of the Radio Shack Line Printer VIII that are automatically supported by Scripsit and can be turned on and off from within your document as it's printing. The LPVII can't underline, but it can use text elongation. These features are switched on and off by using three-byte codes. If you have a non-Radio Shack printer, you can use the print control option to change these bytes to access your printer's special features (if they can be activated by a three-byte code, which many of them are). On my printer I use the elongation codes to do superscripting.

One important point to consider about Disk Scripsit is that you must have the Scripsit disk in drive zero. This is because the program constantly refers to the disk to load different segments of the program (this means the program takes up less memory space, leaving more room for your text).

TEXTPRO I and TEXTPRO II

Cer-Comp
5566 Ricochet Avenue
Las Vegas, NV 89110
(702) 452-0632

THE NEXT WORD processing level is Textpro, a line-oriented program that lets you specify any special printer features you need.

Like the Basic programs, you display delete, insert, move, copy, and edit text by the line. Additional commands let you resequence, remove and replace, automatically sequence, and suppress printing of the line numbers (the last lets you print draft copies of your text for easy copy editing).

Like Scripsit, printer commands can be

embedded in your text file for use when printing that file. Additional printer commands are: indentation (moving printing temporarily away from the left margin), line skipping, skipping to next page, footnotes, messages to the operator during printing (such as "change disks"), and bottom of page test (check to see if the number of lines left on the page are enough to print without breaking the text, so as not to break up a chart) are all supported. One very important command is printer control, which lets you send any special printer controls you want to the printer from within your text. This feature lets you use all the features of your printer, whether it's superscripting, subscripting, underlining, changing fonts, or what-have-you.

Because this word processor doesn't use a control key to access any commands, you don't have to use both hands to use it, an important plus for the handicapped.

Textpro II has all the abilities of Textpro, plus a few more. You can get a disk directory, kill a file, and rename a file. A special command, ROLL, lets you edit a file that is actually too large to fit in memory all at one time.

Additional embedded text commands allowed are page footers, right justify, character fill (used to fill an entire line with a specific character), set printer tab stops (for easy column alignment), right justify tab (line up columns on the rightmost character instead of leftmost at tab position), center word on tab, and for numbers, line up decimal point on the tab position.

Telewriter

Cognitec
704 Nob Avenue
Del Mar, CA 92014
(619) 755-1258

THE TELEWRITER MANUAL is divided into two parts, a tutorial that teaches you how to use the program, and a reference manual that details the commands. This approach makes it simple to learn and, once you've mastered the program, easy to refresh your memory about commands you may not entirely remember.

In addition to the commands mentioned in Table 1, the editor routine has page forward and reverse (move the display ahead or back 15 lines), search for special characters (non-alphabetic characters such as printer control codes), and a high speed mode to allow fast text

REVIEWS ■ ■ ■

entry in large text files (most word processors slow down when you have more than six or seven thousand characters in your text and you try to insert information at the beginning).

The print mode gives you the ability to specify print font, send printer control codes, and underline support for the Epson MX-80 printer.

You can also set parameters from inside your text, giving you dynamic printer control. The ability to embed printer control codes in text lets you use all the capabilities of your printer, including changing the print fonts.

The disk version of Telewriter has all the power of the cassette version, plus disk commands to change disk file names, print the directory (to the screen or the printer), use drives other than zero as the default file drive, and go to Basic and return to Telewriter without losing your text file (unless you use complex Basic commands that wipe out your text). It also supports the Epson Graftrax option.

A new version of Telewriter, which wasn't available when this article was prepared, called Telewriter 64 is now for sale. This new version gives you three screen displays; the standard 51 by 64, and two new ones, 64 by 24 and 85 by 24. These new displays require a good TV or monitor to be readable. To accommodate these new displays, Cognitec developed a new character set. You can switch between the old character set and the new one and use whichever you find most readable. Right justification, hyphenation, tab stops, comment lines, user definable page number position, ASCII I/O (Input/output), and wild card search (you can specify a search pattern that will match anything) have all been added to Telewriter 64.

Telewriter 64 costs \$49.95 on cassette, or \$59.95 on disk. Owners of Telewriter may upgrade for only half-price.

Super Color Writer II

Nelson Software Systems
a division of Softlaw Corporation.
9072 Lyndale Avenue
Minneapolis, MN 55420
(612) 881-2777

SUPER COLOR WRITER II has the most extensive manual of the word processors reviewed, and is the only non-Tandy documentation produced on a daisy-wheel printer.

In addition to the commands listed in Table 1, Super Color Writer II lets you

switch the display color between green and orange, page forward or back 15 lines at a time, use string search with a wild card option (rec##ve would find both receive and recieve), auxiliary lines (used when headers or footers are not long enough), and comment lines.

Printer commands let you specify the page number and its position, 20 programmable character codes (for characters that can't normally be produced from the keyboard), and any special functions your printer is capable of executing (underline, italics, print fonts, and so on).

The real power of Super Color Writer II lies in its three programmable functions. These special functions are created by combining up to 28 commands, functions, modes, or keystrokes into one programmed function, which can then be executed up to 65535 times. For example, to print multiple files, you could define a function as clear memory, CLOAD a file, and print the file (using the correct commands and syntax, of course), and then tell it to repeat for as many files as you want consecutively printed. These three functions are limited only by your imagination for their use.

Super Color Writer II has one feature of special interest to the handicapped, it has a one-hand control key. You press the control key once, then press the command key of your choice to activate the function. As with Textpro, you don't need both hands to use this program.

Disk Super Color Writer II lets you see the directory, a free space map, and kill disk files.

Conclusion

Before you decide to buy a word processor you should first write down what you need it for: term papers, correspondence, magazine articles, advertising circulars, program documentation, and so forth. Then write down what the word processor has to be able to do; if your printer can only underline and print elongated text, you don't really need a processor capable of supporting exotic printers, but if you have to have headings, footings, flush left and right printing, centering and right margin justification, make a note of these features.

After you've done this homework, compare the features and prices of the word processors available. If you have any questions, call the company producing the program and ask. A phone call is cheaper than buying a package that doesn't do what you thought it did. ■ ■



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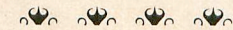
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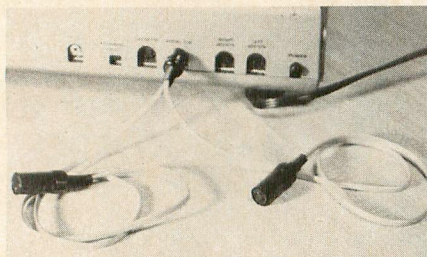
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RS-232 Expansion Cable

Spectrum Projects
93-15 86th Drive
Woodhaven, NY 11421
(212) 441-2807
\$20

by Terry Kepner

THE DESIGNERS OF the Color Computer overlooked an important point; by not including a second RS-232 port or a parallel printer port it is difficult for Color Computer owners to communicate via the RS-232 port and drive a printer at the same time. When communicating over the phone lines with a Bulletin Board Service, I frequently want to use my printer to record information I've received. With the Color Computer I

have to unplug my modem, plug in the printer, print the information I've saved in memory, and then reconnect the modem to continue operation.

Spectrum projects has changed that with their RS-232 Expansion Cable. This cable has a male 4-pin connector that plugs into your Color Computer and two female 4-pin connectors attached by two-foot cables to the one male plug. This means that you can connect two RS-232 devices to your computer at the same time. An obvious advantage. Add to that advantage, the realization that the extra two feet of length gives you more flexibility in the placement of these devices around your computer, making this Y connector a worthwhile product.

The Spectrum Paddle

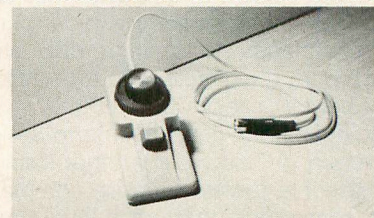
Spectrum Projects
93-15 86th Drive
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(212) 441-2807
\$19.95

by Terry Kepner

SPECTRUM PROJECTS has released a game control paddle for the Color

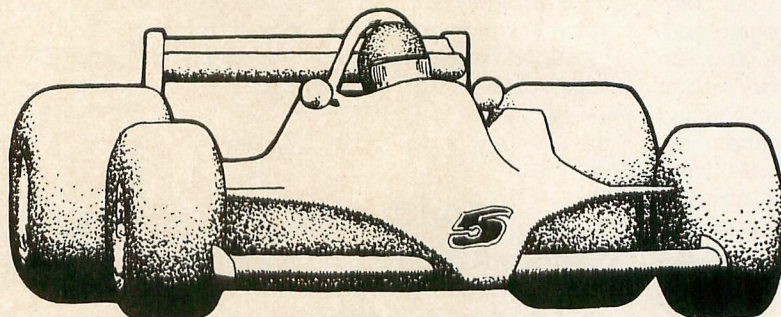
Computer. Game paddles are similar to joysticks except that they control one axis (horizontal) instead of two (horizontal and vertical). The Color Computer joysticks use the JOYSTK(0) and JOYSTK(1) commands to read horizontal and vertical axes of the right joystick port, respectively. When plugged into the right joystick port, the Spectrum paddle is read by JOYSTK(0).

The advantages to using a paddle instead of a joystick are subtle, but important. Many games require back and forth movement in only one axis (Clowns, Popcorn, and Pong, to name a few), so you don't need the full directional control of



a joystick. In fact, it can be a handicap. Joysticks give more freedom of hand movement than you might want, which makes it easy to lose control of the game. In addition, the joystick handle is more difficult to position precisely since it is re-

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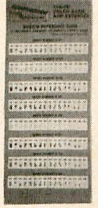
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stricted to a turning arc of only 90 degrees, a bit more than one degree of arc for each of the 64 number values generated by the joystick. In this way, a slight movement can result in a large on-screen movement. By comparison, the paddle controls can be turned a full 270 degrees, over four degrees of arc per number generated. This gives you more precise control with the paddle. Also, when using the paddle, you can't pick up the control incorrectly and use the wrong directional to control screen movement (I've lost more than one Pong game by trying to move my screen paddle vertically instead of horizontally).

If you have small children and want to teach them better hand-eye coordination, the paddle is a better choice than the joystick. Turn left, the object on the screen moves left, turn right, it moves to the right. With the joystick, you can move left by pushing the handle up to the left. Right movement can be initiated with a down and to the right positioning of the joystick handle. More than a little confusing for hand-eye training.

The unit itself is well-constructed, with a cable almost 5½ feet long. Just below the large control knob is the fire control

button, which gives a good solid feel with solid spring action.

If you have games, or write games that don't need the full X-Y axis control of a joystick, get the Spectrum Paddle.

TRS-80 Color Basic and Extended System Reference Card

Nanos Systems Corp.
P.O. Box 24344
Speedway, IN 46224
\$4.95

by Kerry Leichtman

ONE OF THE MOST useful pieces included with any major software package is the reference card. The intention of the card is to save your documentation from being dog-eared to death as you search for commonly-used but forgotten information. Nanos Systems' System Reference Cards broadens the quick-information concept of a handy reference guide.

The card is similar to the one you received with your Color Computer. That card told you how to attach, plug-in, and

get your computer to the OK prompt. It also told you Basic and Extended Color Basic functions and commands, explained a few things about graphics characters, and listed error messages. In short, that card was a handy guide to your humble computing beginnings.

Nanos Systems Corp. has saved your documentation manuals from further "how do I get that machine to perform that blasted function" frantic dog-ear bound searches. The TRS-80 Color Basic and Extended System Reference Card crams so much information into a fan-fold format that it is in danger of needing a reference card itself — but it doesn't.

Listed under such headings as "Playing Music," "Making Music," "To Get the Best Visual Effects on Graphics," the information is easy to find and use. At its suggested retail price of \$4.95, it will be hard to find a better bargain to help you get the most out of your Color Computer.

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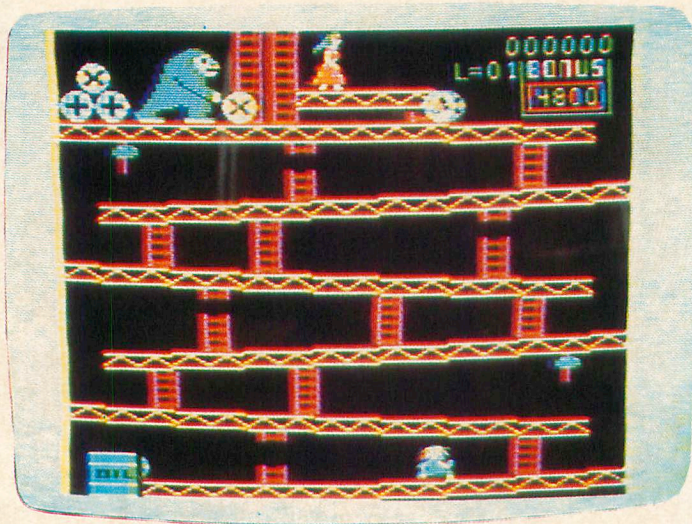
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Donkey King

Tom Mix Software
3424 College, N.E.
Grand Rapids, MI 49505
(616) 364-4791
32K Machine Language
\$24.95 Tape \$27.95 Disk

by Kerry Leichtman

IF YOU HAVE ever played the arcade game that Tom Mix's Donkey King derives from, you won't miss a thing by playing Mix's version. I never played the arcade version because of a basic mistrust of the gimmick: You put in a quarter and get three chances to do whatever that particular game wants you to. The gimmick is that it'll cost you \$20 or \$30 to get to where you'll get good mileage from one quarter.

Of course, buying Donkey King (or any other worthwhile game) will cost you a goodly amount anyway. But the point is, if you're going to spend the money why rent the game?

The arguments I'm always hearing about how Atari graphics, and Apple graphics (etc.) are far superior to what the Color Computer can produce are easily laid to rest with Donkey King. Next time someone lays that garbage on me I'm going to whip out a copy of Donkey King from my software holster and CLOADM that argument to rest.

The Game

You are a little red-haired man charged with saving a fair lady from an unsavory ape. In the first screen (of four) the ape rolls barrels at you as you attempt to climb inclines and ladders to get from the bottom of the screen to the top,

where the fair lady is held prisoner. You have two weapons at your disposal; a hammer, at the first and next-to-last level, that is capable of demolishing barrels and fireballs, and an Olympic jumping ability. Timing is the key to successful jumps. Jumping over the barrels gets you points. It also frustrates the ape. But he's the bad guy anyway.

The next three levels are a mystery to me. I have made it to the second screen, but haven't beat the monkey there yet. The set-up is of steel girders and ladders. Fireballs are again at your heels, and again you have hammers at two locations with which to combat them. Jumping over the fireballs doesn't seem to work, but goodness knows I keep trying. You can, however, jump from girder to girder and the fireballs can't.

Someday I'll get to the third and fourth screens and save the fair lady from the filthy beast. Although it might be easier for me to program a little airplane for my red-headed friend to buzz around and shoot at him with. But the point is that someday I will get to those screens because the game is that much fun to play.

Another plus is the game's practice mode. While the normal play mode of Donkey King allows you three little men for saving the fair lady, the practice mode gives you 12. There's nothing I dislike more than finally getting the hang of something and then being told GAME OVER.

The graphics are excellent. If you're only at 16K this game would be a good reason for you to upgrade. Of course one game alone is not reason enough. But consider the excellence of Donkey King as an example of what the Color Computer is capable of if you give it enough power.

Advanced Star Trench Warfare

Illustrated Memory Banks
P.O. Box 289
Williamstown, MA
(413) 458-5161
16K Cassette only
\$18.95

by Bob Liddil

MOST GRAPHICS PROGRAMS written in Basic are too slow to compete in the flashy machine-code arcade game marketplace, but Illustrated Memory Banks and author Fred Scerbo are the exception to this rule. Their new release, Advanced Star Trench Warfare comes alive with color, action, and scoring opportunity. The game requires a 16K cassette-based machine.

It's a familiar scenario. You must defend the Star Trench from attack by alien spacecraft. They dance all over the target screen in an attempt to keep away from your lasers. Your view is that of a pilot looking through the cockpit window of a defending fighter. The trench moves below and to the front in a startling display of multi-colored perspective graphics. Above the trench darts the enemy and outside the moving display is a realistically-drawn static fighter ship dashboard with a laser charge meter, which informs you of the power you have left.

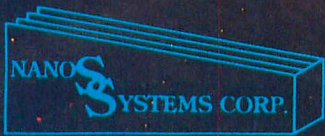
Firing your lasers to excess exhausts your energy supplies and because the screen has no sighting area, you never know precisely where you're shooting and so must fire more often. Catch 22. Zeroing in on the enemy doesn't take excessive amounts of time, so the author's gamble of deleting the crosshairs or gun-sights pays off in increased challenge.

If this were all there were to the program it would be well worth its price, but there's more. The game also runs in 3D! That's right. A pair of those blue/red Creature From The Black Lagoon glasses (not included with the program) makes the screen explode in awesome depth illusion. The entire game takes on a life of its own. Don't get me wrong; this is not

Please turn to page 62



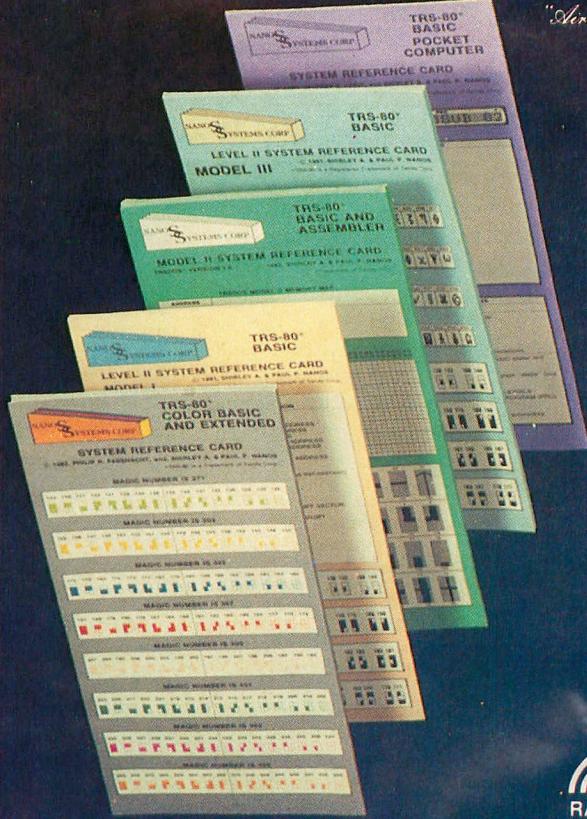
illustration by Rod McCormick



Nanos Systems Corp.

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Each card is a complete summary of the reference manuals and the microcomputer. Cards are two or more colors, printed on 80 pound Beckett Antique cover stock or a comparable stock, stretch-wrapped in plastic for shipping. They are accordion-foldup cards, in the same style as the traditional IBM reference cards used on the major computers for years. Fold-up size is eight and one-half by three and three-quarter inches, so they will fit easily into the shirt pocket. These cards provide a complete summary of the manuals plus many extras at your fingertips.

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REVIEW\$

Continued from page 60

"comin' at ya" style 3D. It's a more subtle, layered background style that lets you forget the TV and concentrate on the action.

Advanced Star Trench Warfare is a flawlessly executed game and stretches the shoot-em-up genre to the limits without being pretentious and self-proclaiming.

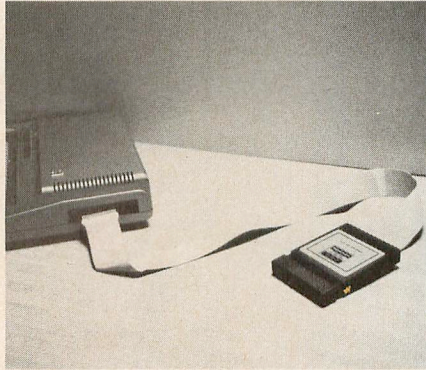
It's a great little game.

Disk Interface/ROMpak Extender

Spectrum Projects
93-15 86th Drive
Woodhaven, NY 11421
(212) 441-2807
\$29.95

by Terry Kepner

ONE OF THE difficulties of owning the Radio Shack Color Computer Work Station is that the back of the Color Computer fits under the enclosure shelf that supports the color monitor. The enclosure hampers access to the ROM car-



tridge slot of the Color Computer. The only way to plug, or unplug, a cartridge is to pull the computer out from under the shelf and then slide it back in place when you're finished. After you've done this a few hundred times, it becomes annoying.

Enter Spectrum Projects. Spectrum sells a Disk Interface/ROMpak Extender cable, three feet long, that plugs into the ROMpak slot. At the other end of the cable is a connector that fits over the edge card connection of a ROMpak. Not only is this more convenient than the cartridge slot on the computer, but it also

saves wear and tear on the computer and the expansion port connection pins.

If you don't have Radio Shack's Work Station desk but you do have disk drives, the cable makes it easier to fit the disk system on a table without having the extra-long disk controller cartridge get in the way of your disk drive's door.

The cable also lets you use a smaller space more efficiently by giving you the option of placing the ROMpaks on the opposite side of your computer from the disk drive (by running the cable under your computer).

Finally, if you want to connect the Color Computer to the outside world, this cable makes it easier for you to position your special equipment without crowding the rest of your computer items.

The TDP Systems 100

by Bob Rosen

TANDY DISTRIBUTOR PRODUCTS (TDP), is a new distribution channel for the marketing of Tandy produced merchandise. At the moment, their main

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products are antennas and computers. Tandy Distributor Products involves some 60 independent distributors of RCA products supplying 2000 retailers. The TDP System 100 is their version of the Color Computer.

All Color Computer software and peripherals are TDP-100 compatible, but there are differences from past Color Computer models. The most obvious difference is the outside case. Instead of gray, the TDP-100's case is white. The ventilation holes are across the top instead of the sides. With the heating problems of the SAM chip, this is a welcome improvement. The RAM ID buttons are replaced by an attractive blue TDP label. Beneath the keyboard is a lip for resting your palms while typing. The letters on the back of the computer are raised plastic instead of pressed on.

With the external differences covered, we'll explore the TDP-100's internal differences. The board has been completely redesigned, and contrary to popular belief of D and E board owners, it isn't marked F but NC or ET. The board's new design makes the upgrade from 16K to 64K easy; no more cutting traces or jumping wires. All you need do is remove

the smaller RF shield, which covers only the memory chips and the 6883.

To remove the shield, bend the seven tabs on the bottom of the shield downward. Once inside, move three jumpers from the 16K position to the 64K position and install a fourth jumper on two bare staking pins. Then cut eight capacitors out of the board and Voila! you have 64K. With the price of 64K chips dropping, it's a wise investment since many high-quality arcade-type games require 32K RAM. Also, the FLEX DOS requires 64K and many programs have been rewritten to take advantage of the added memory.

Looking closer into the TDP-100 you'll see a new cassette relay; instead of a reed relay the new machine uses a 12 volt DC relay. This makes the clicking more pronounced when you turn on the computer or tape recorder. The keyboard PIA has been replaced by the 6822 that generates less hash during keyboard interrupts. The cartridge door is now part of the main board instead of the top case and the power supply's new location makes servicing easier. The part numbers of the chips have been changed, so you'll need a new technical manual. The PIA's



are no longer U4 and U8 but U17 and U18. The Basic and Extended Basic chips have been moved to the middle of the board. Besides these changes are also a few others, but these are minor.

The TDP-100, which is identical to the latest version of Radio Shack's Color Computer, is an improvement over past Color Computers.

All TDP-100's come with two joysticks and a Super Bust-out ROMpak; and for repairs and service, a toll-free number tells you the nearest of the 52 nationwide TDP service centers.

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END OF FILE



ell, there you have it, issue number one is history, "Whew." I hope you enjoyed the magazine and are looking forward to issues number two, three, four, fifty, and so on. We have aspirations, goals, desires, dreams, plans, and hopes for **The Color Computer Magazine's** future. Many of them require your input, all require your support.

Before we go into the future, let me quickly take you through the past.

The Color Computer Magazine was born in a Howard Johnson's restaurant in Portsmouth, New Hampshire. From there it moved to the more suitable surroundings of New England Publications's offices in Camden, Maine.

Then we were off to Fort Worth, to meet the makers — so to speak. After having been involved with TRS-80 microcomputers for some time now, it was nothing short of awesome to see the Tandy Towers lit up in the dark Texas night.

Our three days in Texas were dizzying. We came to think of the elevators in One Tandy Center as our home away from home. An appointment on the 18th floor, the next one on the 17th, then off to another on the 3rd, oops we're behind schedule for a different meeting on the 17th, then zoom off to the 4th, and we'd better catch some lunch, oh it's four o'clock might as well wait till dinner — which we didn't get to until nine. No matter really, I left my stomach somewhere in the elevator shaft at One Tandy Center.

The reception we received at every meeting (regardless of the fact that my face was beginning to turn green) was friendly, cooperative, and full of enthusiasm for our project.

Our tour of the Color Computer manufacturing plant left us with one unshakable thought — Tandy is undeniably committed to the continued success of our favorite computer.

And so are we. Which brings us to the present and future (which is where your support comes in). Let us know of your enjoyment and frustrations with your Color Computer. What types of articles you'd like to see more of, and which ones in smaller doses. We'll soon be starting a question and answer column. To do so we, of course, need your questions. No question is insignificant. If something is causing you grief you're probably not alone.

The Color Computer Magazine is being published to help you get the most out of your computer. We invite your comments, criticisms, and suggestions. All letters and article submissions should be addressed to: **The Color Computer Magazine**, Highland Mill, Camden, Maine 04843. Unless otherwise noted all letters will be considered for publication. Manuscripts should be accompanied by a self addressed stamped envelope (SASE).

There are a few things you should know about our structure. Our program listings are printed using a Radio Shack Daisy Wheel II printer with a Courier 10 pitch print wheel for easy reading. The column formats are either 32 or 65 characters wide. While 65 characters is fairly standard, we included the 32 character width to help you keep your place when typing in listings. (The Color Computer screen displays 32 character lines.)

One more note: TDP System 100 computers are completely compatible to Radio Shack's Color Computer. Both machines are produced by Tandy in the same factory. Therefore, all references to the Color Computer also apply to your TDP 100.

New product reviews are written objectively, rather than critically. Reviewers are asked to state what the product does and how well it performs. You can then weigh one product's features against another according to your personal needs rather than the reviewer's.

Beginning with the April issue (number 2) we'll be offering a tape of most of the programs from the first two issues. The price will be modest, but the savings in wear and tear on your typing fingers will be substantial.

Tell your Color Computer friends about us, tell our advertisers where you saw their ad, and be sure to pick us up again next month.

FOR...NEXT (04,83)

YOUR NEXT ISSUE of **The Color Computer Magazine** is something to look forward to. The issue's highlight is the most complete Color Computer memory map ever published. Contributing Editor Jake Commander has located and documented every byte of your computer's ROM. The map is only the beginning. Succeeding issues will comment the map in such a way that even novice programmers will be able to take advantage of its secrets.

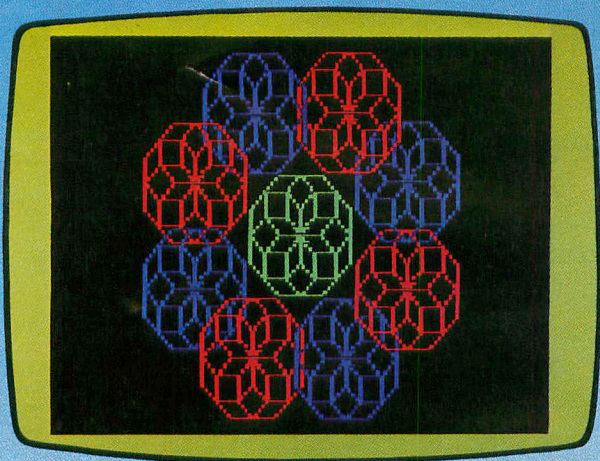
Dennis Kitsz performs more hardware wonders in his next

installment of Custom Color with a method of controlling electric devices through your computer.

Also to come in April: CC Speller teaches children how to spell, puzzles by Richard Ramella, a utility to expand your screen format to a 51 by 24 display, and a whole lot more.

We'll also have a host of reviews, including the remainder of the Color Computer word processing guide, smart terminal packages, games, books, and other products for your scrutiny.

Look What Radio Shack Has In Store for Your TRS-80® Color Disk System



Kids love turtles—especially the kind that draws the designs in our new Color Disk LOGO program. Using our enhanced version of LOGO, children are able to experiment with logical and geometrical relationships at their own pace. They learn by doing, and have fun at the same time. Kids not only learn

NEW! Color Logo

- “Turtle” Graphics Allow Children To Learn by Hands-On Experimenting
- “Doodle” Mode for Pre-Readers
- “Hatch” Command Creates a Second Turtle for Running Several Programs Simultaneously

how to write programs, but they can investigate structured thinking, multi-tasking, inter-process communication, modular programming, parameter passing, local and global variable, and looping and recursion—all from teaching their turtle how to draw designs on the video screen! No wonder LOGO is a favorite with computer scientists and educational theorists as well as kids! (26-2721, \$99)

Ask “What If?” With Spectaculator

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Here's an “electronic spreadsheet” program that's easy to set up and use, yet does the forecasting, planning and problem-solving you need. Just enter the numbers and formulas—Disk Spectaculator will calculate and display the results on command. Enter new figures and it updates every related number. You can run totals of each column and grand total, plus save worksheets to disk for later use. (26-3256, \$59.95)

Personafile Keeps Records Handy

SUBJECT..MY STUFF
TAG.....STEREO
REALISTIC STA 2000. PURCHASED 11/30/80. HOUR 18 SPEAKERS.
PURCHASED 11/30/80 SCT-33 TAPE RECORDER/PLAYER. PURCHASED 11/30/82. REALISTIC 5 - BAND EQUALIZER. PURCHASED 12/23/82.
<BREAK> TERMINATES INFO ENTRY
ARROW KEYS MOVE CURSOR
<CLEAR> DELETES LINE
<SHIFT-CLEAR> INSERTS LINE

No more frantic searching for the auto insurance, TV warranty, rabies certificate or the recipe for Aunt Tilly's chile. Put your records in Personafile and say goodbye to cluttered drawers stuffed with pa-

pers. With Personafile records are easy to find and recall in just seconds. Allows up to 540 records with up to 250 different subjects. (26-3260, \$59.95)

Disk SCRIPSIT™ for Word Processing

<p>■ Now you can have in capacity to store and quick access complete programs of large amounts of data with TRS-80 Color Computer — just add one or more Color Disk drives with Disk Color BASIC. Check the many advantages: plus-in Program Pak control allows quick and easy attachment of disk drives to your Color Computer! does not require the user to understand an “operating system” or to use an alternate operation mode. New-80082 Line-832 881-832</p>	<p>Key Summary:</p> <table border="1"> <thead> <tr> <th>Key(s)</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>left arrow</td> <td>Moves cursor 1 character to the left.</td> </tr> <tr> <td>right arrow</td> <td>Moves cursor 1 character to the right.</td> </tr> <tr> <td>up arrow</td> <td>Moves cursor 1 line up.</td> </tr> <tr> <td>down arrow</td> <td>Moves cursor 1 line down.</td> </tr> <tr> <td>Shift u.a.</td> <td>Moves cursor to the end of the line.</td> </tr> </tbody> </table>	Key(s)	Function	left arrow	Moves cursor 1 character to the left.	right arrow	Moves cursor 1 character to the right.	up arrow	Moves cursor 1 line up.	down arrow	Moves cursor 1 line down.	Shift u.a.	Moves cursor to the end of the line.
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Shift u.a.	Moves cursor to the end of the line.												

Color Disk SCRIPSIT lets you create correction-free letters, themes and reports right on your video screen. It will display upper and lower case letters and even let you print one document while working on another. (26-3255, \$59.95)

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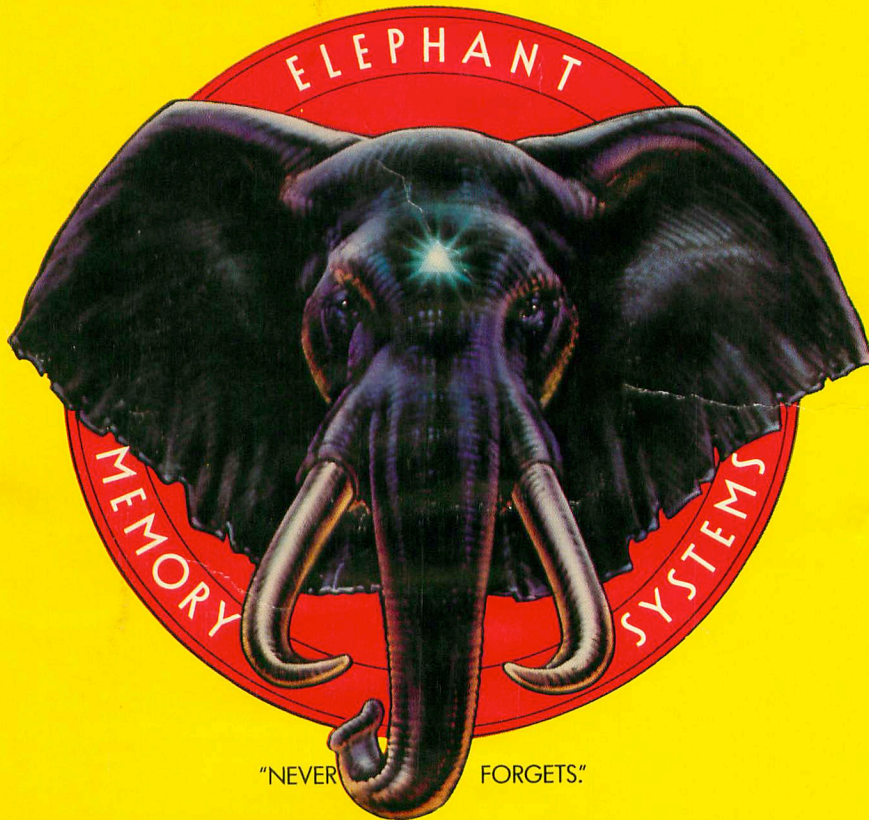
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